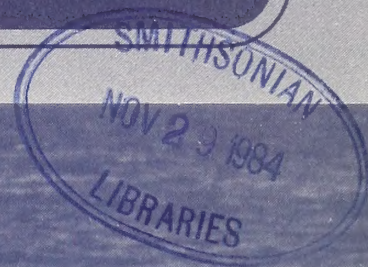


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The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, III: New Marine Isopoda

BRIAN KENSLEY



SMITHSONIAN CONTRIBUTIONS TO THE MARINE SCIENCES • NUMBER 24

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The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, III: New Marine Isopoda

Brian Kensley

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ABSTRACT

Kensley, Brian. The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, III: New Marine Isopoda. *Smithsonian Contributions to the Marine Sciences*, number 24, 81 pages, 48 figures, 1984.—One new genus, *Chalixanthura*, and twenty-four new species of isopods are described and figured. These include *Chalixanthura scopulosa*, *Eisothistos petrensis*, *Accalathura setosa*, *Apanthura cracenta*, *Pendanthura hendleri*, *Cymodoce ruetzleri*, *Dynamenella quadrilirata*, *Paracerceis cohenae*, *Paracerceis glynni*, *Metacirolana agaricicola*, *Metacirolana halia*, *Metacirolana menziesi*, *Gnathia rathi*, *Astacilla regina*, *Stenetrium bowmani*, *Stenetrium patulipalma*, *Stenetrium spathulicarpus*, *Bagatus punctatus*, *Angliera psamathus*, *Microcharon sabulum*, *Joeropsis bifasciatus*, *Joeropsis personatus*, *Munna petronastes*, and *Microcerberus syrticus*. Figures and/or descriptions are also provided for *Stenetrium minocule* Menzies and Glynn, *Stenetrium stebbingi* Richardson, *Joeropsis coralicola* Schultz and McCloskey, and *Joeropsis rathbunae* Richardson. With a few exceptions, all material comes from the coral reef system at Carrie Bow Cay, Belize. Depth and ecological data, where available, are provided.

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The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, III: New Marine Isopoda

Brian Kensley

Introduction

The Smithsonian Institution's Investigations of Marine Shallow-Water Ecosystems program at Carrie Bow Cay, Belize, started in 1972. (For a full report on this program, see Rützler and Macintyre, 1982.) From that time on, samples of isopod crustaceans were accumulated, usually incidental to other projects. I started collecting at Carrie Bow Cay in 1978, with an initial interest in anthuridean isopods. Later, an ecological project involving numerous quantitative samples from the reef crest revealed a number of common but undescribed species of isopods. It was eventually decided to identify all the Carrie Bow isopod material and, in the course of this project, even more undescribed species came to light, until a total of 24 new species had been recognized.

One reason that so many new species have been found at a single location is that much of the collecting was done with the aid of SCUBA, allowing fine-scale sampling of microhabitats. In this area, Gordon Hendler of the Smithsonian Oceanographic Sorting Center, in particular, has produced many valuable samples incidental to

his echinoderm research. Other workers who provided useful samples include Anne Cohen, Kristian Fauchald, and Klaus Rützler.

The purpose of this paper is to record only the undescribed species from Carrie Bow Cay. In a few cases, it has been necessary to include descriptions and figures of earlier species, to resolve taxonomic tangles. Two new genera and seven new species from Carrie Bow Cay were previously described in *Smithsonian Contributions to the Marine Sciences*, number 12 (see Kensley, 1982). The bulk of the material listed in the "Material Examined" sections comes from Carrie Bow Cay, Belize (16°48'N, 88°05'W). Specific data are provided for material from other localities. The collecting stations are provided with prefixes that indicate both the collector and his/her field station numbers; these prefixes and collectors are

AC Anne Cohen
CBC Klaus Rützler
F Kristian Fauchald
H Gordon Hendler
K Brian Kensley
RC Brian Kensley (quantitative reef crest samples)

All material has been incorporated into the Smithsonian Institution's collection and given USNM catalog numbers. In the accompanying figures, a scale (in millimeters) is given only for the entire animal in dorsal view.

Brian Kensley, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560.

Other abbreviations used are

juv(s) juveniles
ovig ovigerous
TL total length

ACKNOWLEDGMENTS.—In addition to the collectors mentioned above, I am also very grateful to the many collectors of isopod material from Carrie Bow, who have not been specifically mentioned. I would like to thank Klaus Rützler, coordinator of the IMSWE project, for his help in making several of my collecting trips possible and for identifying sponge material and also Ted Bayer, who identified gorgonacean material. My thanks are due to a number of people who assisted me with fieldwork and collecting, including Marilyn Schotte (who also drew the whole-animal illustrations in Figures 21, 23, 30, and 38), Michael Carpenter, Tony Rath, and David Russell. The tedious task of sorting hundreds of samples was carried out by Marilyn Schotte, Deborah Robertson, and Lee Benner, to whom I am very grateful. Dr. Jean Just, of the Zoological Museum, Copenhagen, made the loan of type material possible. Three trips to Belize were made possible by Fluid Research Fund grants from S. Dillon Ripley, Secretary of the Smithsonian Institution.

Drs. Thomas E. Bowman, Richard C. Brusca, and George D. Wilson read the manuscript. Their numerous comments led to an immeasurably improved paper, and I owe them my sincere thanks.

This paper is contribution number 134 of the Smithsonian Institution's Investigations of Marine Shallow-Water Ecosystems.

Suborder ANTHURIDEA

Family HYSSURIDAE

Chalixanthura, new genus

DIAGNOSIS.—Eyes present. Antenna 1, flagellum of 3 articles in female, 7 in male. Antenna 2, flagellum of 7 articles. Mandibular palp 3-articulate. Maxilliped of 7 articles; short endite

present. Pereopod 1, propodus barely expanded, similar to pereopods 2 and 3. Pereopods 4–7 with triangular carpus. Pleopod 1 operculiform, both rami forming operculum. Pleonites 1–5 short, free; pleonite 6 free. Telson lacking statocysts.

TYPE-SPECIES.—*Chalixanthura scopulosa*, new species, by present designation.

COMPOSITION.—*Chalixanthura scopulosa*, new species.

GENDER.—Feminine.

REMARKS.—Of the group of hyssurids with pleonites 1–5 short and free, only *Coralanthura* and *Panathura* also have a maxilliped of seven articles and an endite and lack telsonic statocysts. *Coralanthura*, however, possesses a differentiated subchelate pereopod 1, i.e., the propodus is expanded far more than in pereopods 2 and 3. *Chalixanthura*, by contrast, has pereopods 1–3 undifferentiated. *Panathura* is characterized by a larger maxillipedal endite than is seen in *Chalixanthura*, by the anterior three pereopods having peg-like or spine-like teeth on the propodal palms, and by having a more squat body form (7–8 times longer than wide; 13–14 times longer than wide in *Chalixanthura*).

ETYMOLOGY.—The generic epithet is derived from the Greek *chalix* (pebble or rubble) plus the frequently used suffix *-anthura*.

Chalixanthura scopulosa, new species

FIGURES 1–3

MATERIAL EXAMINED.—*Holotype*: USNM 211200, non-ovig ♀, TL 2.5 mm, sta K-139, reef crest rubble, 0.1 m.

Paratype: USNM 211201, 1 non-ovig ♀, TL 2.0 mm, sta K-139, reef crest rubble, 0.1 m.

Additional Material: Seventeen specimens, taken during a quantitative survey of reef crest rubble isopods, were used in the description of this species. Included in this batch were one submale and three males (TL 2.5 mm). These specimens have since been lost.

DESCRIPTION.—*Non-ovigerous Female*: Body slender, about 13 times longer than wide. Inte-

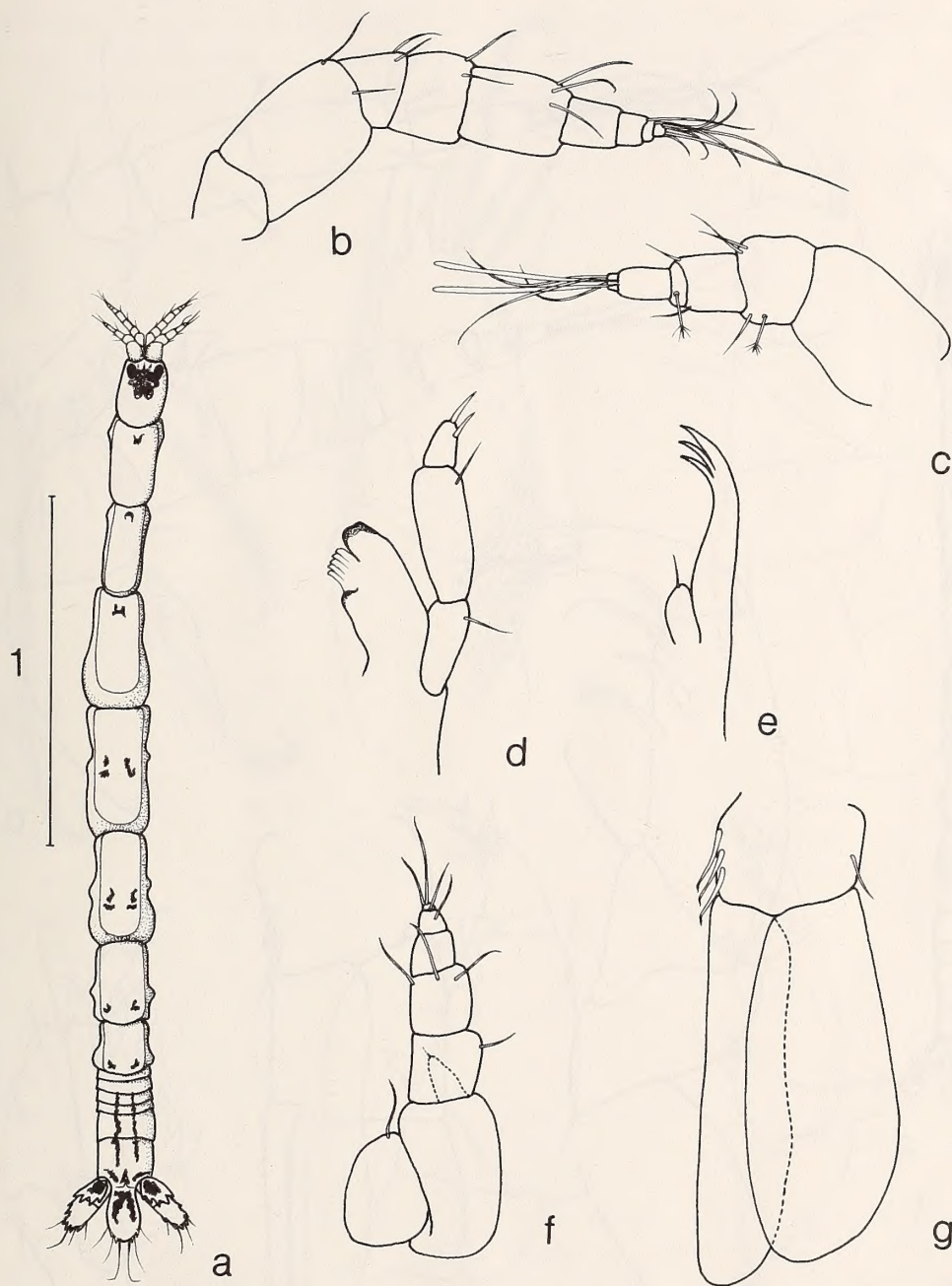


FIGURE 1.—*Chalixanthura scopulosa*, new species, ♀: a, whole animal, dorsal view; b, antenna 2; c, antenna 1; d, mandible; e, maxilla; f, maxilliped; g, pleopod 1.

gument thin, except for slightly indurate uropods and telson. Pigmentation: patch between eyes on dorsum of head; pereonites 1–3 with small middorsal anterior patch; pereonites 4–7 with pair of posterior submedian patches; pleon

with pair of submedian longitudinal stripes; telson with double anterior patch; uropodal exopod with broad patch. Body proportions: $C < 1 < 2 = 3 > 4 > 5 > 6 > 7$. Head with tiny rostral point. Pleonites 1–4 short, subequal; pleonite 5

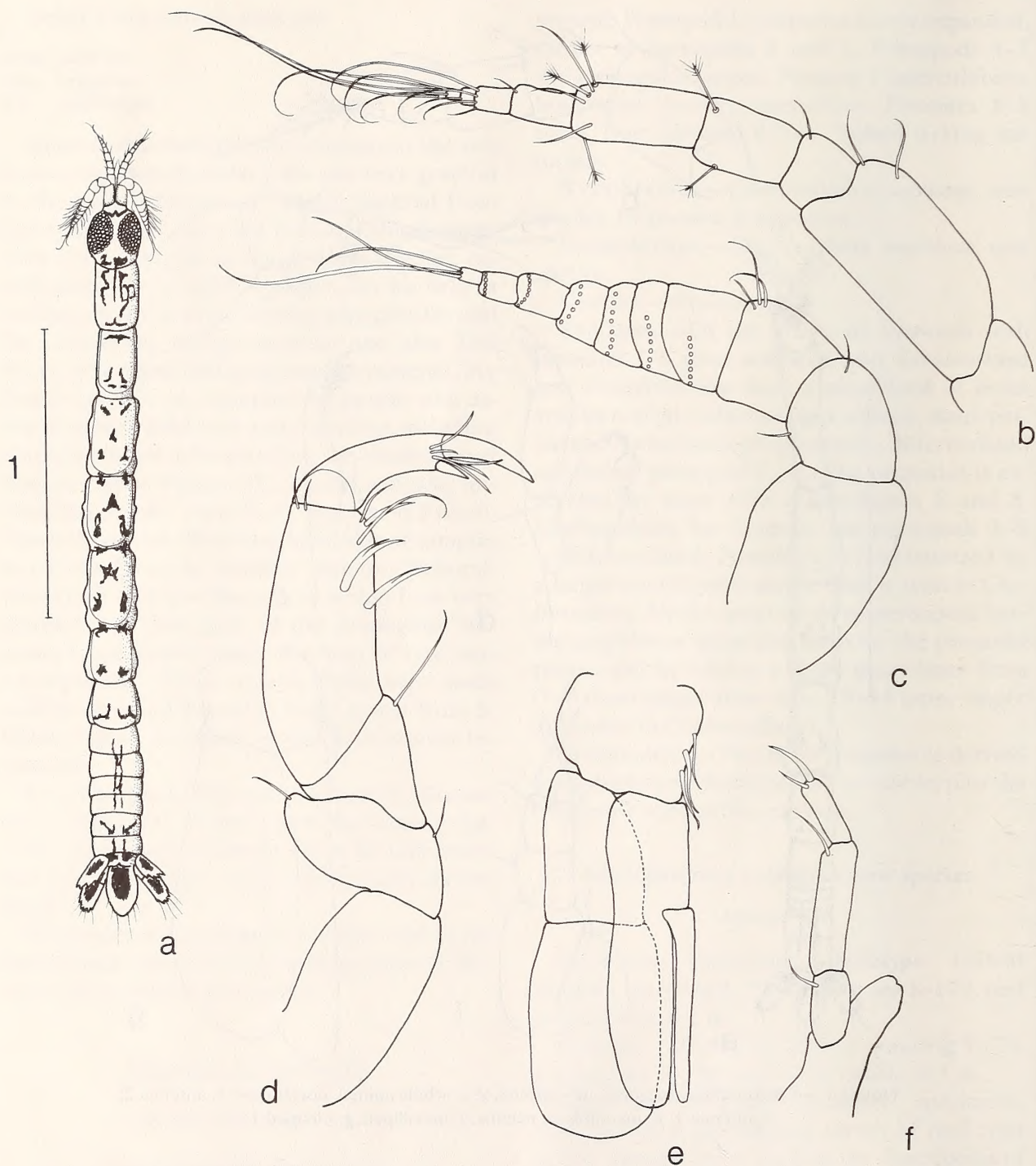


FIGURE 2.—*Chalixanthura scopulosa*, new species, ♂: *a*, whole animal, dorsal view; *b*, antenna 2; *c*, antenna 1; *d*, pereopod 1; *e*, pleopod 2; *f*, mandible.

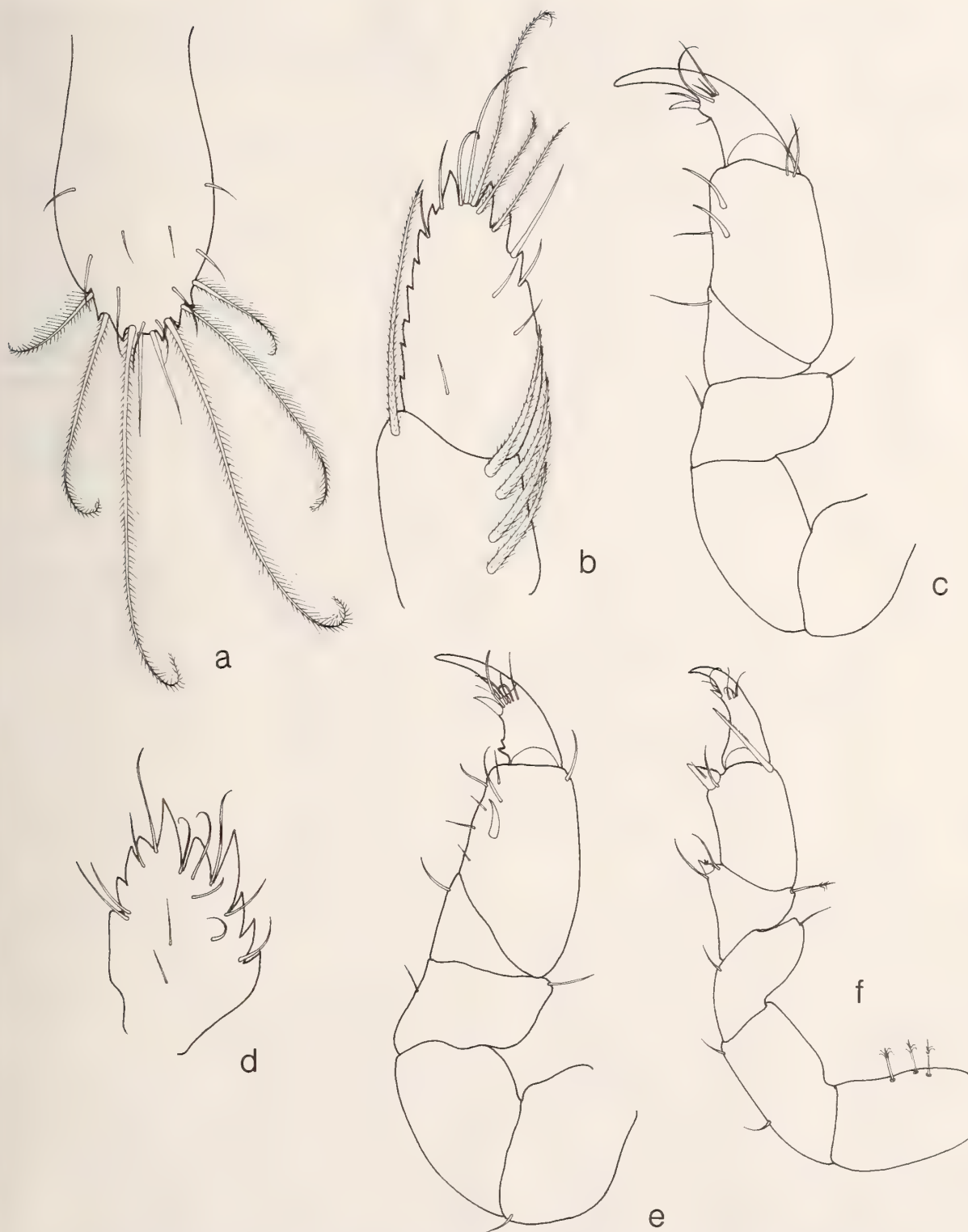


FIGURE 3.—*Chalixanthura scopulosa*, new species, ♀: *a*, telson; *b*, uropodal endopod and basis; *c*, pereopod 1; *d*, uropodal exopod; *e*, pereopod 2; *f*, pereopod 7.

3 times length of pleonite 4; pleonite 6 twice length of pleonite 5, posterior margin with mid-dorsal notch. Telson elongate-ovate, widest posterior to midlength; posterior margin armed with 6 large teeth and 6 elongate plumose setae.

Eyes well pigmented, dorsal. Antenna 1, basal peduncular segment longer than 2 distal segments together; flagellum of 3 articles, penultimate article bearing 2 aesthetascs. Antenna 2, segment 2 longest and broadest; flagellum of 4 articles. Mandibular palp 3-segmented, segment 2 $1\frac{1}{2}$ times length of segment 1; segment 3 $\frac{1}{3}$ length of segment 2, bearing 2 distal spines; incisor consisting of single broad cusp; lamina dentata of 5 teeth; molar small, rounded. Maxilla, exopod bearing 3 distal spines. Maxilliped 7-segmented (including fused basal segment); endite not reaching distal margin of segment 3, with single terminal seta. Pereopod 1, unguis almost equal in length to rest of dactyl, with strong accessory spine; propodus barely expanded, posterior margin straight. Pereopod 2, very similar to pereopod 1. Pereopod 7, propodus and triangular carpus each with short stubby dentate spine at posterodistal corner. Pleopod 1 operculiform, both rami forming operculum; basis with 3 coupling hooks; endopod slightly longer and 0.6 times width of exopod. Uropodal exopod margin bearing 10 strong teeth; endopod elongate-ovate, with 12 strong marginal teeth and few distal plumose setae; basis with several stout plumose setae on outer margin.

Male: Head with eyes enormously expanded, both dorsally and ventrally. Pigmentation on pereon stronger than in female. Pleonites 1–6 free, subequal in length, longer than in female. Antenna 1, flagellum of 7 articles, all except terminal article bearing ring of aesthetascs. Mandibular palp similar to female, rest of appendage reduced to rounded lobe. Pereopod 1, propodus more elongate than in female, with 3 strong sensory spines on or near posterior margin. Pleopod 2, exopod with transverse suture anterior to midlength; endopod with copulatory stylet articulating near midlength of median margin, not overreaching distal margin of ramus.

ETYMOLOGY.—The specific epithet is from the Latin *scopulus* (crest or ridge) and refers to the reef crest habitat of the species.

Genus *Eisothistos* Haswell, 1884

Eisothistos petrensis, new species

FIGURES 4–6

Eisothistos atlanticus.—Barnard, 1925:134 [not Vanhöffen, 1914:494].

PREVIOUS RECORDS.—St. James Bay, St. Thomas, West Indies, 10 m (5 fms) (as *E. atlanticus*).

MATERIAL EXAMINED.—*Holotype:* USNM 211202, non-ovig ♀, TL 4.0 mm, sta RC-94, reef crest rubble, 0.1 m.

Allotype: USNM 211203, ♂, TL 2.0 mm, sta RC-96, reef crest rubble, 0.1 m.

Paratypes: USNM 211204, 4 ♂, TL 1.5–2.0 mm, 4 ♀, TL 2.0–4.3 mm, sta RC-91, RC-93, RC-97, RC-120, reef crest rubble, 0.1 m.

Additional Material: USNM 211205, 10 ♀, 3 juvs, sta RC-8, RC-10, RC-40, RC-59, RC-94, RC-96, RC-99, RC-100, RC-119, reef crest rubble, 0.1 m. USNM 211206, 2 ♀, 2 juvs, sta K-70a, K-139, K-150, reef rubble, 0.1–36.0 m. USNM 211207, 1 ♂, 4 ♀, 1 juv, sta H(80)-8, H(80)-31, H(80)-32, H(80)-39, H(80)-49, reef rubble, 0–15.0 m. USNM 211208, 4 ♀, 1 juv, sta H(81)-8, H(81)-12, H(81)-40, H(81)-41, 1–15.2 m. USNM 211209, 1 ♂, sta F-4, rubble, 0.25 m. USNM 211216, 1 non-ovig ♀, Looe Key, Florida, coral rubble in spur and groove zone, 5–6 m.

Copenhagen Museum Collection: 4 ♀, St. James Bay, St. Thomas, West Indies, 7 m, coll. T. Mortensen, 19 Dec 1905.

DESCRIPTION.—*Female:* Body slender, widening posteriorly. Integument anteriorly soft, becoming indurate posteriorly. Head with lateral eyes consisting of 6 ommatidia each; frontal margin between antennular bases gently convex. Relative proportions of pereonites variable, but pereonites 1–3 generally subequal, longer than pereonites 4–7; latter decreasing in length poste-

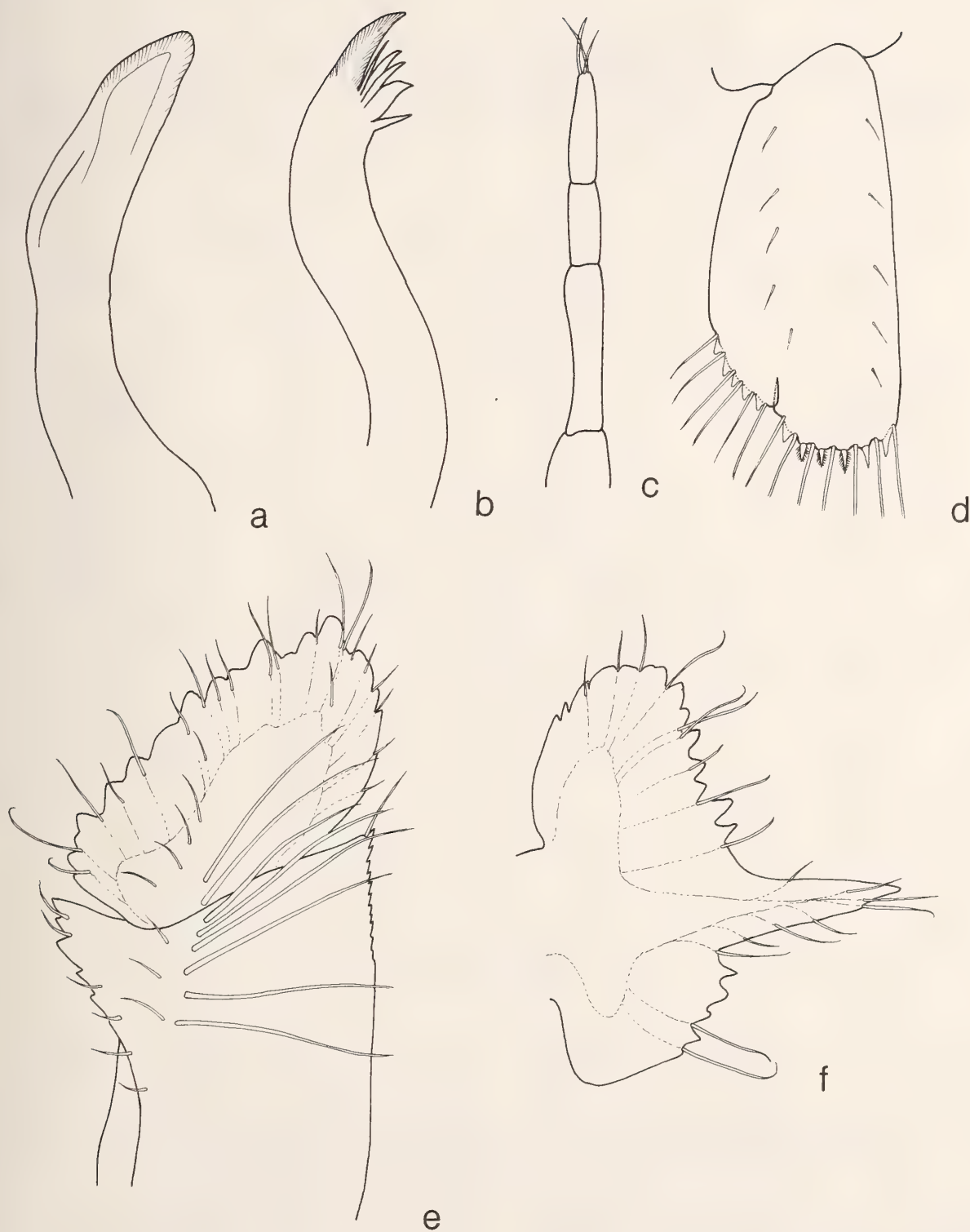


FIGURE 4.—*Eisothistos petrensis*, new species, ♀: *a*, mandible; *b*, maxilla; *c*, maxilliped; *d*, pleopod 1; *e*, uropodal protopod and endopod; *f*, uropodal exopod.

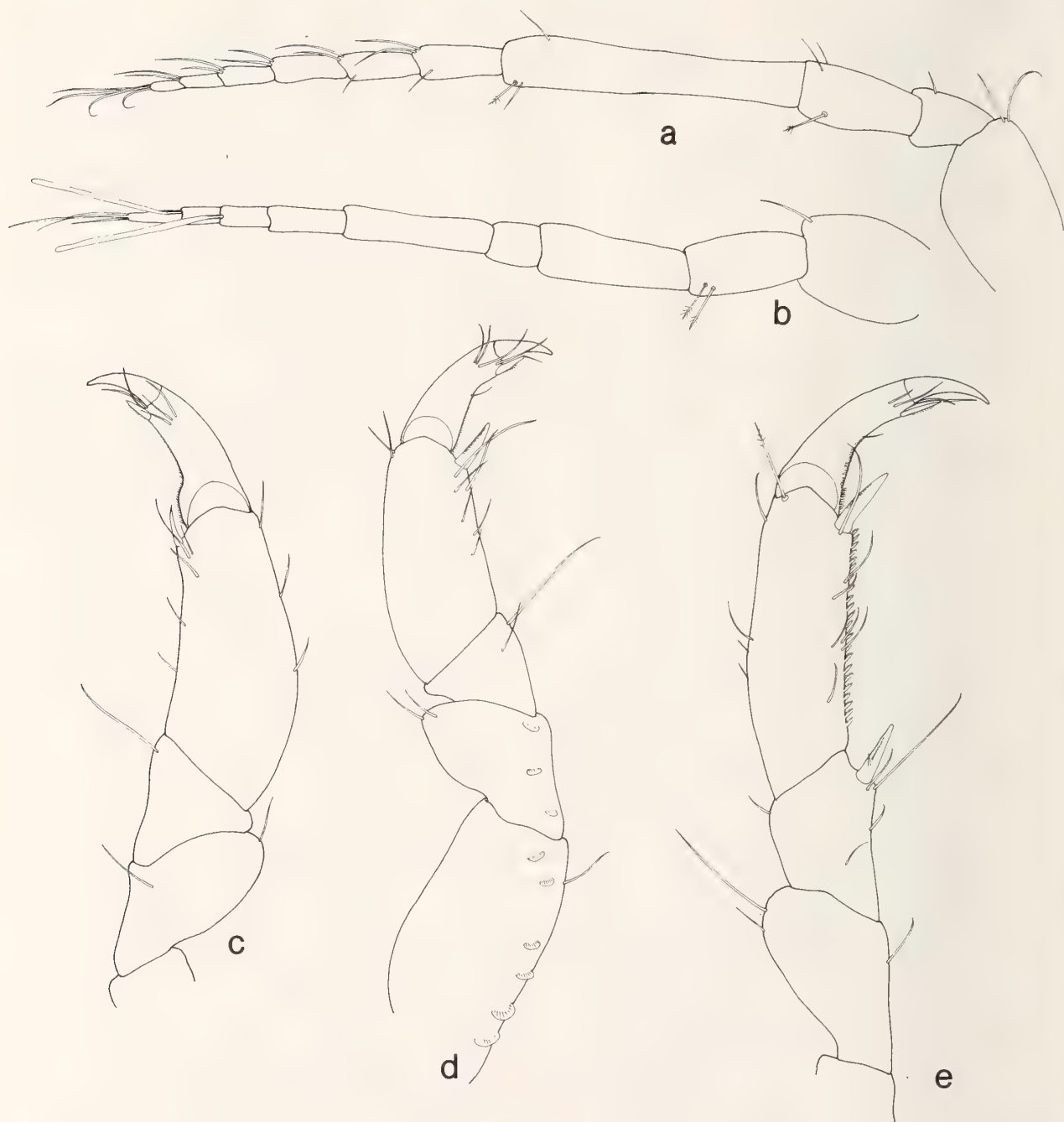


FIGURE 5.—*Eisothisos petrensis*, new species, ♀: a, antenna 2; b, antenna 1; c, pereopod 1; d, pereopod 2; e, pereopod 7.

riorly. Pleonites 1–5 short, pleonite 6 slightly longer; pleonites bearing plumose lateral setae. Telson with posterior margin faintly bilobed, margin strongly serrate; posterior half dorsally

somewhat spooned; faint middorsal ridge anteriorly.

Antenna 1, basal segment subequal in length to segment 2, $1\frac{1}{2}$ times as wide; segment 3, $1\frac{1}{3}$

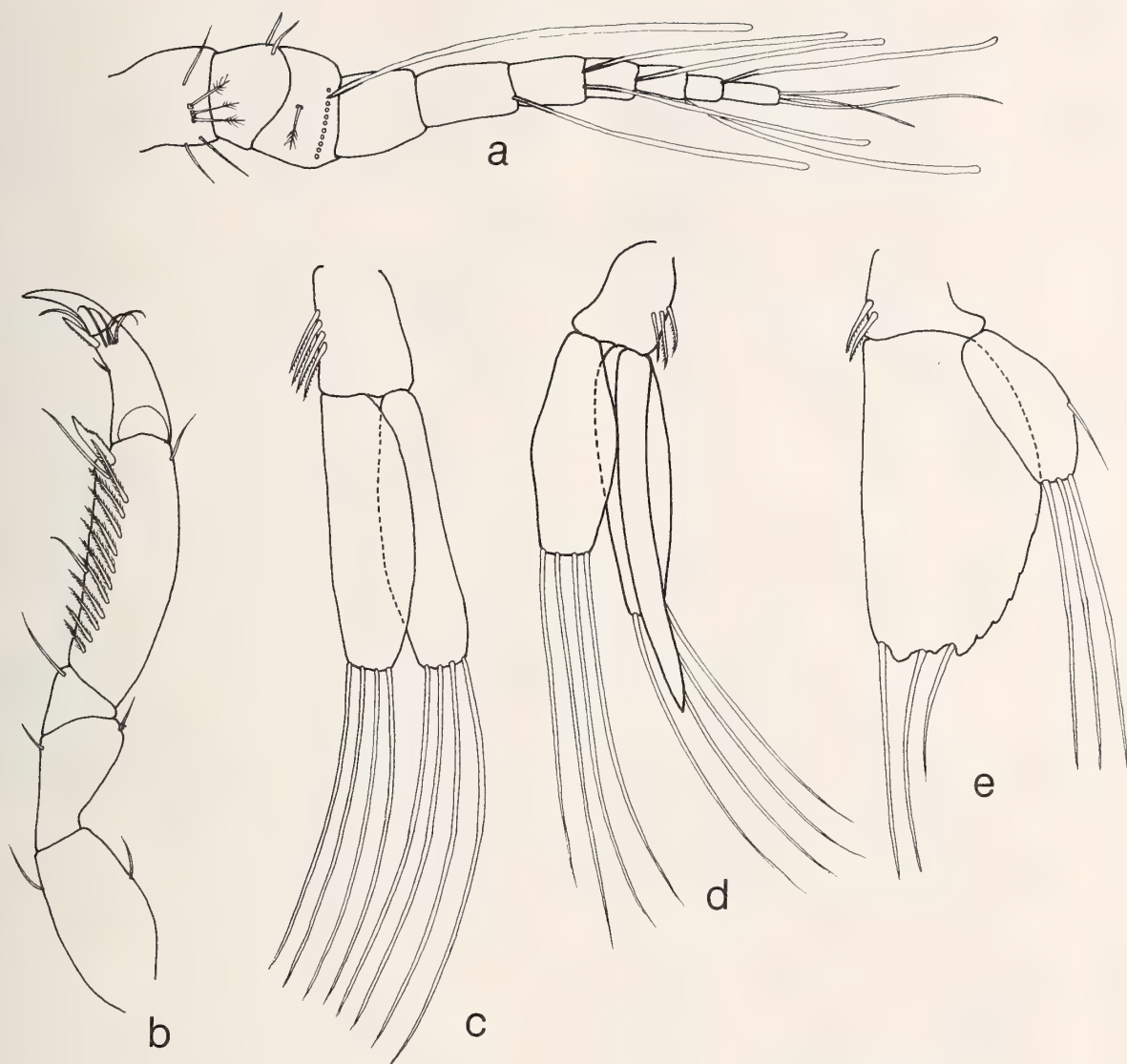


FIGURE 6.—*Eisothisos petrensis*, new species, ♂: *a*, antenna 1; *b*, pereopod 1; *c*, pleopod 1; *d*, pleopod 2; *e*, pleopod 3.

times longer than segment 2; flagellum of 6 articles, second article longest; single aesthetasc on articles 4 and 5. Antenna 2 with peduncle segment 5 $2\frac{1}{2}$ length of segment 4; flagellum of 6 articles. Mandible consisting of single stout distally curved sclerotized structure. Maxilla sinuous, with 1 large sclerotized spine and 5 smaller spines. Maxilliped slender, of 4 segments, terminal segment with 3 simple apical setae. Pereopod 1, carpus triangular; propodus relatively longer than in pereopods 2 and 3, posterior margin

almost straight, with slender posterodistal spine; unguis $\frac{1}{3}$ length of dactylus, with strong finely serrate accessory spine. Pereopods 2 and 3, ischia and meri with rounded peg-like spines on medial surface; carpi triangular, propodi with posterior margins straight, bearing strong striate posterodistal spine; strong accessory spine of dactylus finely serrate. Pereopods 4–7 with carpi becoming more elongate, bearing strong serrate posterodistal spine; propodi becoming more elongate posteriorly, posterior margin lined with fringed

scales, bearing strong striate posterodistal spine; unguis about half length of remainder of dactylus, with strong finely fringed accessory spine. Pleopod 1, rami fused, operculiform, slight distal slit indicating region of fusion, distal margin of fused endopod bearing fringed and simple spines between elongate plumose setae. Uropodal exopod elongate-oval, with margins strongly serrate, and strong acutely triangular process at about midpoint of outer margin. Endopod elongate-oval, margins coarsely serrate; both rami with broad hyaline margin; protopod with inner and outer distal margin serrate, with elongate plumose setae on ventral surface.

Male: Generally shorter than female. Eyes enlarged, extending to ventral area of head, of about 12 ommatidia each. Antenna 1, flagellum of 9 articles, basal article with row of elongate aesthetascs, 5 distal articles, except terminal article each with 1 or 2 aesthetascs. Mouthparts reduced, nonsclerotized. Pereopod 1, propodus with row of 11 serrate spines on mesial surface, strong posterodistal spine. Pleopod 1 rami not fused, narrow, each with 4 elongate plumose setae; pleopod 2 with strong saber-shaped copulatory stylet articulating at base of, and extending beyond, endopod; latter longer than mesially broadened exopod; both rami with 4 elongate plumose setae on distal margin. Pleopod 3 endopod broadly oval, with 3 distal plumose setae; exopod $\frac{1}{2}$ length and less than $\frac{1}{2}$ width of endopod, bearing 4 plumose setae. Uropodal exopod narrower than in female, with strong acutely triangular process on outer margin. Telson narrower than in female, with middorsal ridge running almost entire length.

REMARKS.—Of the 11 described species of *Eisothistos*, six possess dorsally unarmed telsons, one of the easiest features to determine. Further comparison of telsons, along with other features, serves to separate *E. petrensis* from these six species.

Eisothistos vermiformis Haswell, from Australia, has a distally truncate and crenulate telson.

Eisothistos maledivensis Wägele, from the Maldiv Islands, has a parallel-sided telson (i.e., not posteriorly flared); the uropodal endopod is

more elongate, whereas the rami of pleopod 2 are relatively short and broad.

Eisothistos anomala (Kensley), from Madagascar, although having a telson very similar to *E. petrensis*, possesses a more oval and apically acute uropodal endopod and a distinctly bicuspid mandible.

Eisothistos moreirai (Pires), from Brazil, has a bicuspid mandible, a serrate posterior margin of the propodus of pereopod 1, and no indication of a fusion slit in pleopod 1 of the female.

Eisothistos bataviae Kensley and Poore, from the Abrolhos Islands, has relatively short first and second antennae and strong movable spines on the anterolateral margins of the telson.

Eisothistos minutus Sivertsen and Holthuis, from Tristan da Cunha, has relatively short first and second antennae and a bilobed uropodal endopod lacking a large spinose process.

Eisothistos atlanticus Vanhöffen (1914) was described from the Cape Verde Islands. Vanhöffen's brief comments and figure are insufficient to define the species. Barnard (1925) recorded *E. atlanticus* from St. Thomas in the West Indies. Barnard's material has been re-examined and found to be conspecific with *E. petrensis*.

ETYMOLOGY.—The specific epithet, from the Latin for "among rocks," refers to the habitat of *E. petrensis*, i.e., coral reef rubble.

Family PARANTHURIDAE

Genus *Accalathura* Barnard, 1925

Accalathura setosa, new species

FIGURES 7, 8

MATERIAL EXAMINED.—*Holotype*: USNM 211210, ovig ♀ (5 eggs in marsupium), TL 8.5 mm, sta RC-7, reef crest rubble, 0.1 m.

Allotype: USNM 211211, ♂, TL 7.0 mm, sta K-63, reef crest rubble, 0.25 m.

Paratypes: USNM 211212, 7 ♂, TL 5.8–7.0 mm, 1 ovig ♀, TL 7.3 mm, 12 non-ovig ♀, 6 juvs, sta RC-91, RC-92, RC-93, reef crest rubble, 0.1 m.

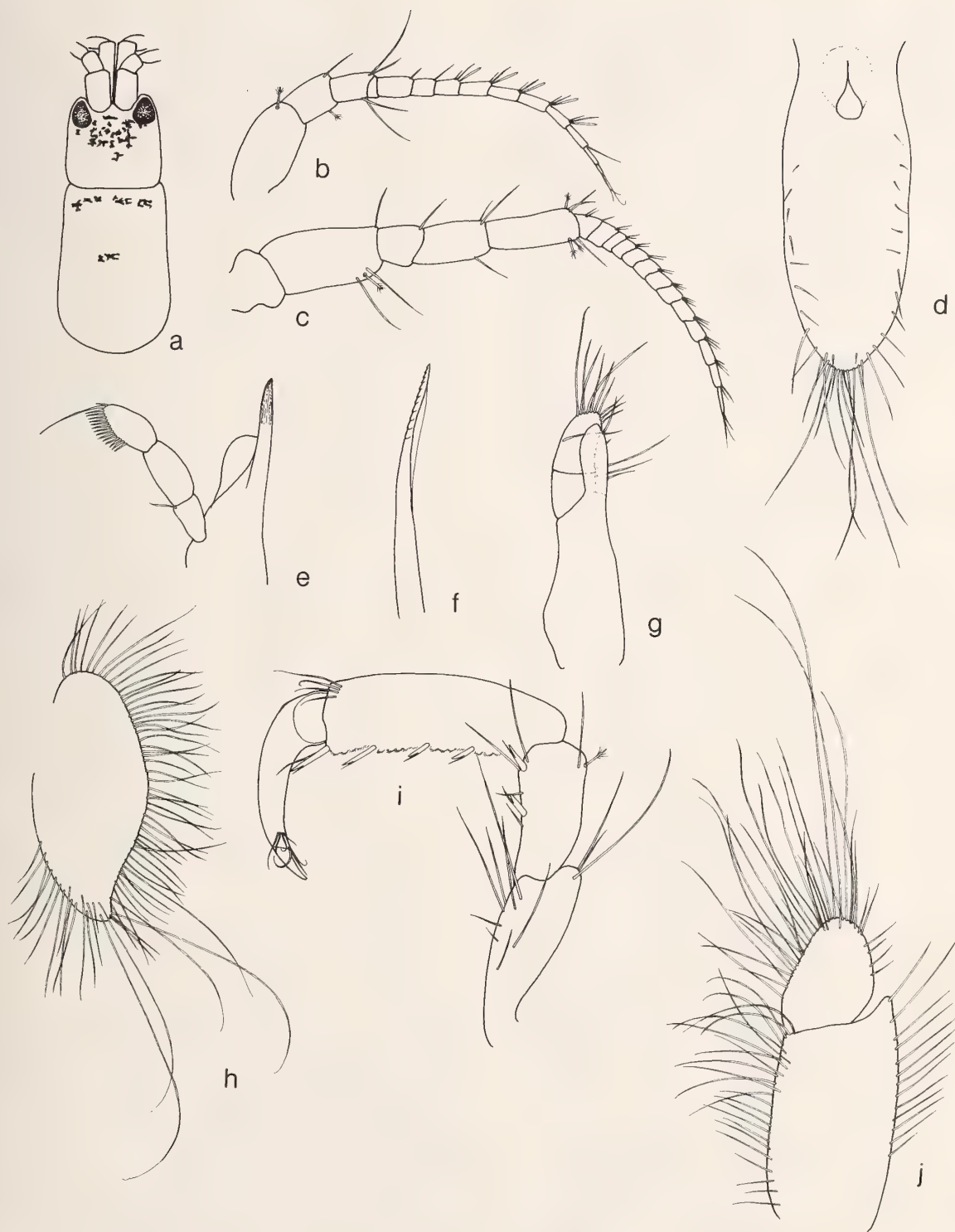


FIGURE 7.—*Accalathura setosa*, new species, ♀: *a*, head and pereonite 1, dorsal view; *b*, antenna 1; *c*, antenna 2; *d*, telson; *e*, mandible; *f*, maxilla; *g*, maxilliped; *h*, uropodal exopod; *i*, pereopod 7; *j*, uropodal endopod and basis.

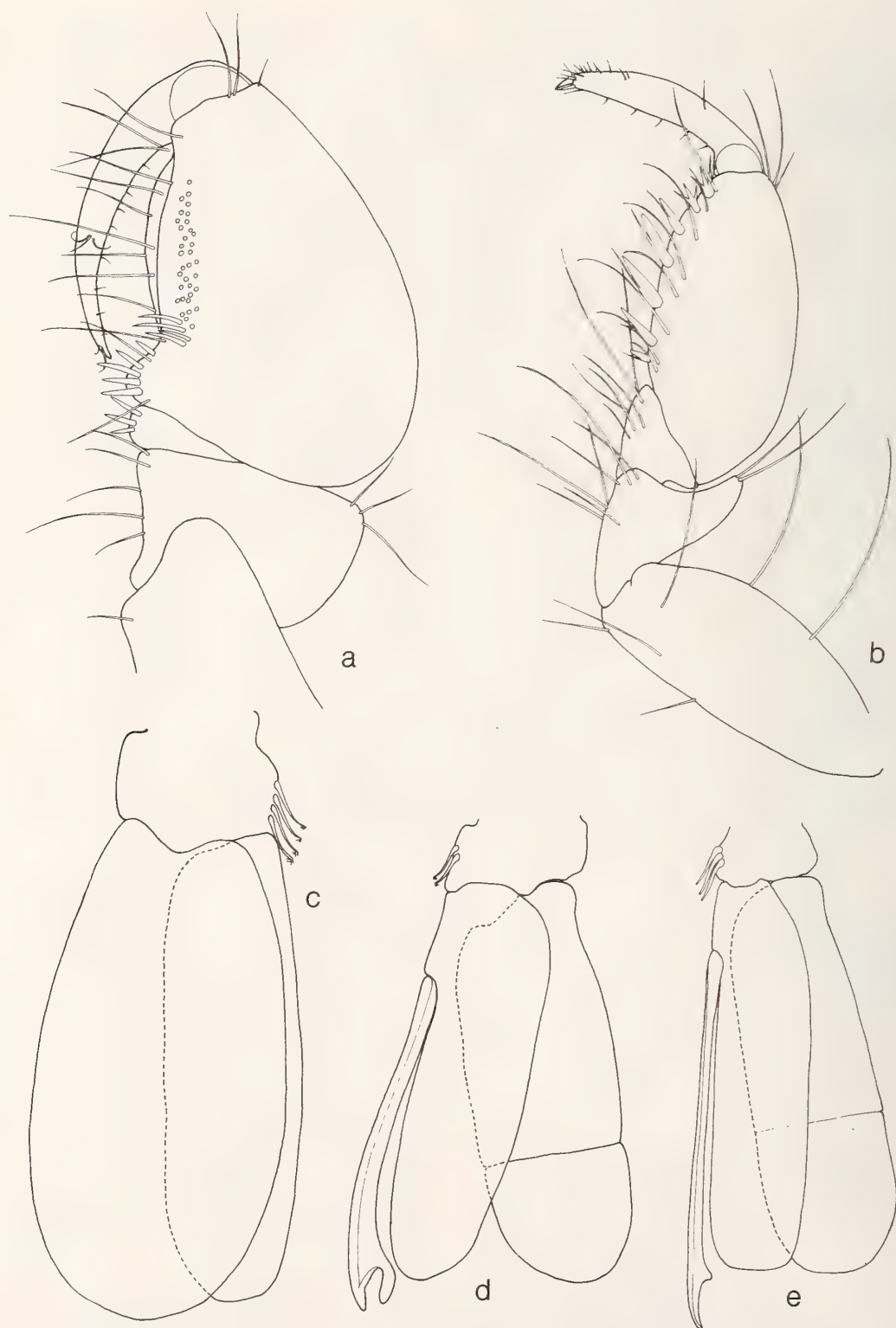


FIGURE 8.—*Accalathura setosa*, new species, ♂: *a*, pereopod 1; *b*, pereopod 2; *c*, pleopod 1; *d*, pleopod 2, ♂. *Accalathura crenulata* (Richardson): *e*, pleopod 2, ♂.

Additional Material: USNM 211213, 6 ♂, 1 sub ♂, 4 ovig ♀, 17 non-ovig ♀, 36 juvs, from 22 RC stations, reef crest rubble, 0.1 m. USNM 211214, 1 ♂, sta K-63, reef crest rubble, 0.25 m. USNM 211215, 1 ♂, 1 ovig ♀, 2 juvs, sta F-151, reef crest rubble, 0.4 m.

DESCRIPTION.—*Ovigerous Female:* Integument moderately indurate; scattered red-brown chromatophores on head, pereon, pleon, and telson. Body proportions: $C < 1 > 2 < 3 < 4 = 5 > 6 > 7$. Head with large dorsal eyes; rostrum low, triangular, not reaching anterolateral lobes of head. Pleonites short, free, 1–4 subequal in length, pleonite 5 slightly longer, pleonite 6 with middorsal slit in posterior margin. Telson with slight anterior constriction, parallel-sided for $\frac{2}{3}$ of length, posteriorly rounded, bearing numerous simple setae of varying lengths; single large anterior statocyst present.

Antenna 1, flagellum of 11 articles, with single aesthetasc on articles 4–8. Antenna 2, peduncle segment 2 slightly more than twice length of segment 3, segments 4 and 5 subequal; flagellum of 13 articles. Mandibular palp with segment 2 longer than segments 1 or 3; latter with 1 elongate and 15 short distal spines. Maxilla with about 11 distal serrations. Maxilliped with endite not reaching distal margin of setose palp segment 2. Pereopod 1, carpus narrowly triangular, with 3 spines on posterior margin; propodus expanded, palm gently convex, with submarginal band of spines on inner surface, rounded proximal lobe bearing 5 spines; unguis almost as long as rest of dactylus. Pereopod 2 with elongate setae on ischium, merus, carpus, and palm of propodus; latter somewhat expanded, with 5 strong sensory spines and 2 distal trispiculose spines; dactylus with very short unguis. Pereopods 2 and 3 similar to pereopod 1 but decreasing in size posteriorly. Pereopods 4–7, meri bearing elongate setae, carpi roughly rectangular, with 2 sensory spines on posterior margin; propodus elongate-rectangular, with 4 sensory spines and numerous fringed scales on posterior margin. Pleopod 1 operculiform, rami subequal in length, exopod almost twice width of endopod. Uropodal exopod with outer margin sinuous,

apically narrowly rounded; entire margin bearing dense simple setae, those at apex longest; endopod narrower than protopod, oval, distally rounded, bearing numerous elongate setae; protopod with numerous setae on outer margin.

Male: Body relatively more slender and pigmented than in female; pigment extending anteriorly to bases of antennae. Pereopod 1, carpus narrow, triangular, bearing 3 spines on posterior margin; propodus much more expanded than in female, with convex palm having narrow flange and rounded proximal lobe bearing 5 strong spines; band of spine-setae on mesial face near palm. Pleopod 2 exopod with transverse suture at distal $\frac{2}{3}$ of length; endopod with copulatory stylet articulating at about proximal $\frac{1}{3}$, extending beyond rami, distally expanded and bilobed.

REMARKS.—Only one species of *Accalathura*, viz., *A. crenulata* (Richardson), has been recorded from the Caribbean. This species co-occurs with *A. setosa* but may easily be distinguished by several features. *Accalathura crenulata* is a larger species (ovigerous female TL 15 mm) and has narrow parallel-sided uropodal exopods, a more elongate uropodal endopod, an apically acute telson, and an apically acute copulatory stylet with a subapical “heel.” *Accalathura setosa* is ovigerous at about 8.0 mm and has a broad sinuous uropodal exopod, a short oval uropodal endopod, an apically rounded telson, and an apically bifid copulatory stylet.

The species referred to by Menzies and Frankenberg (1966) from Georgia as “*Accalathura ?crenulata* juvenile” may well be *A. setosa*, judging from the figure of the tailfan.

ETYMOLOGY.—The specific epithet refers to the highly setose margins of the uropodal rami.

Family ANTHURIDAE

Genus *Apanthura* Stebbing, 1900

Apanthura cracenta, new species

FIGURES 9, 10

MATERIAL EXAMINED.—*Holotype:* USNM 211217, non-ovig ♀, TL 4.6 mm, sta RC-103, reef crest rubble, 0.1 m.

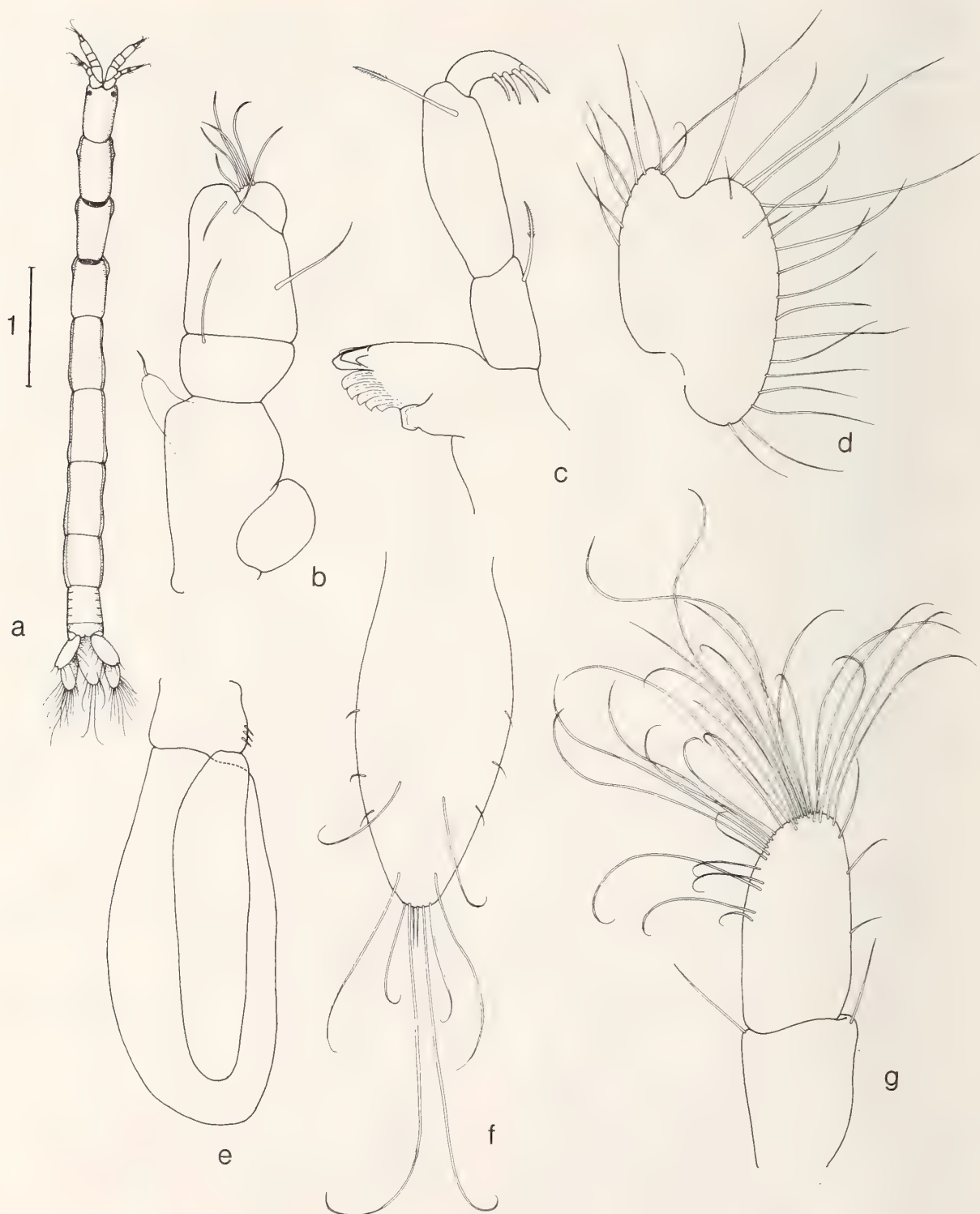


FIGURE 9.—*Apanthura cracenta*, new species: *a*, whole animal, dorsal view; *b*, maxilliped; *c*, mandible; *d*, uropodal exopod; *e*, pleopod 1; *f*, telson; *g*, uropodal endopod.

Allotype: USNM 211218, ♂, TL 3.8 mm, sta RC-22, reef crest rubble, 0.1 m.

Paratypes: USNM 211219, 2 ♂, TL 3.0–3.2 mm, 5 non-ovig ♀, TL 2.6–4.6 mm, sta RC-19, RC-26, RC-100, reef crest rubble, 0.1 m.

Additional Material: USNM 211220, 2 ♂, 19

non-ovig ♀, 3 juvs, sta RC-7, RC-13, RC-21, RC-23, RC-44, RC-56, RC-58, RC-95, RC-99, RC-101, RC-102, RC-104, RC-106, RC-115, RC-119, reef crest rubble, 0.1 m. USNM 211221, 1 ♂, 4 non-ovig ♀, 2 juvs, sta H(80)-11, H(80)-32, reef rubble, 15–27.4 m. USNM 221222, 2 non-

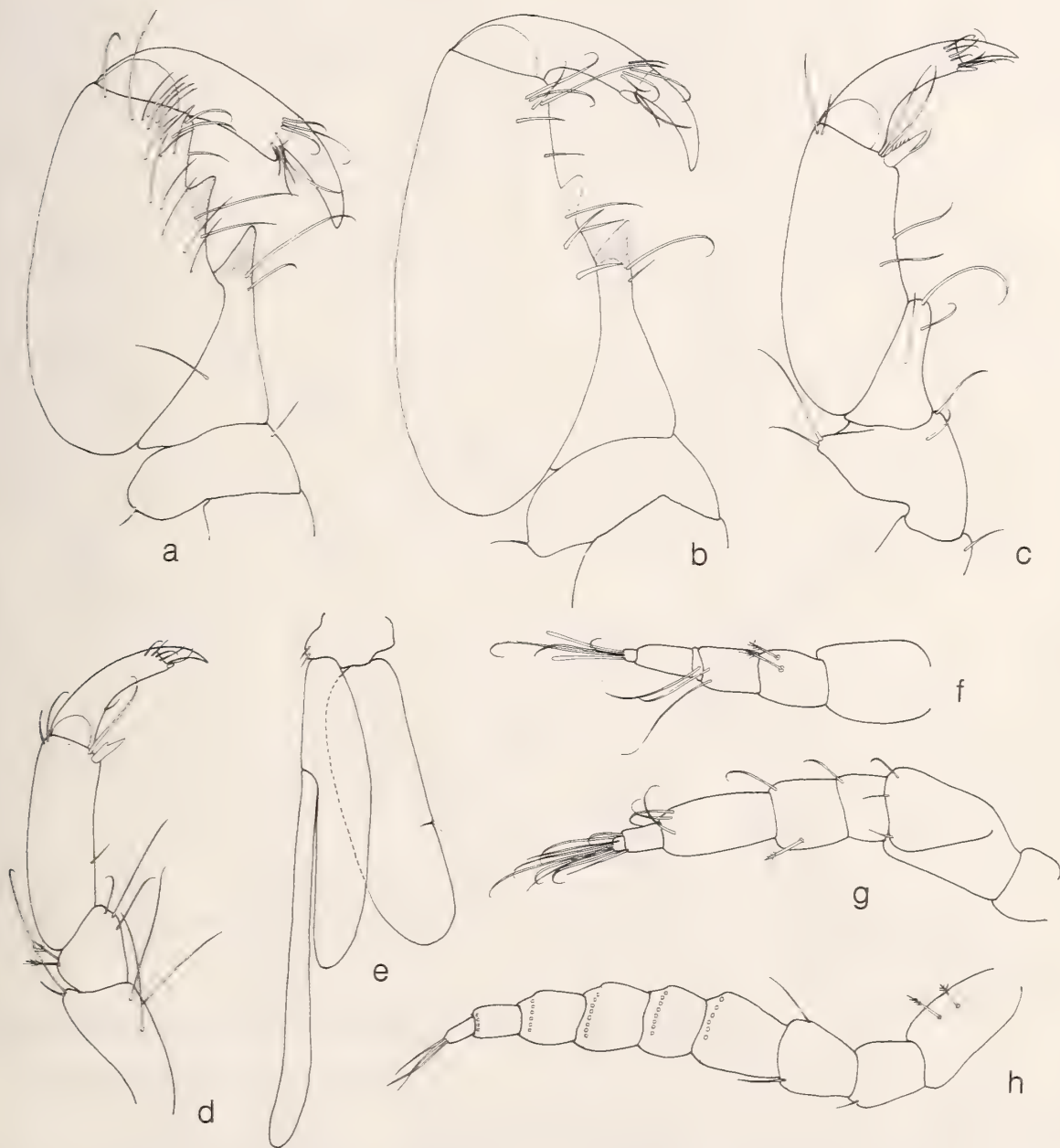


FIGURE 10.—*Apanthura cracenta*, new species: a, pereopod 1, ♂; b, pereopod 1, ♀; c, pereopod 2; d, pereopod 7; e, pleopod 2, ♂; f, antenna 1, ♀; g, antenna 2; h, antenna 1, ♂.

ovig ♀, sta H(81)-41, H(81)-57, reef rubble, 1–2 m. USNM 221223, 2 non-ovig ♀, sta CBC.4.5.74-3, reef rubble, 0.5 m.

DESCRIPTION.—*Female*: Body very slender, about 15 times longer than wide. Integument thin, non-indurate, unpigmented. Body proportions: $C = 1 = 2 > 3 > 4 = 5 = 6 > 7$. Rounded anterolateral lobes of head reaching beyond low rounded rostrum. Dorsolateral eyes small, well pigmented. Pleonites 1–5 fused, lateral slits visible in dorsal view; pleonite 6 free, with bilobed posterior margin. Telson widest at about midlength, posteriorly narrowed, apically evenly rounded, bearing elongate simple setae.

Antenna 1 with basal peduncle segment longest and widest; flagellum of 3 articles, article 2 longest; short terminal article bearing 2 aesthetascs. Antenna 2 with peduncle segment 2 longest, only slightly longer than segment 5; flagellum of 2 short articles. Mandible with 3- or 4-cusped incisor; lamina dentata with 5 broad serrations; molar truncate, sclerotized; palp with segment 2 twice length of segment 1, segment 3 with 4 serrate distal spines. Maxilliped with short thin endite; semicircular terminal palp segment set obliquely at outer distal angle of penultimate segment, bearing 5 elongate setae. Pereopod 1, carpus triangular, with distal acute sclerotized area; propodus expanded, palm bearing rounded sclerotized tooth in proximal half; unguis about half length of rest of dactylus, with short rounded accessory spine at base. Pereopod 2 with triangular carpus; propodus not expanded, bearing strong posterodistal serrate sensory spine. Pereopods 4–7, carpi with anterior margins shorter than posterior; propodi elongate-rectangular, with strong posterodistal serrate spine. Pleopod 1, exopod operculiform, endopod less than half width and slightly shorter than exopod. Uropodal exopod with elongate marginal setae and deep distal notch; endopod twice longer than wide, with outer distal margin bearing numerous elongate setae.

Male: Antenna 1, flagellum of 6 articles, 5 proximal articles each bearing row of aesthetascs. Eyes slightly larger than in female. Pereopod 1,

carpus with posterodistal angle produced into acute triangular tooth; propodal palm with acute triangular tooth at midlength; mesial surface of propodus with more setae than in female. Pleopod 2, copulatory stylet elongate, club-shaped, widening distally, articulating with endopod in proximal half of mesial margin.

REMARKS.—The present species conforms to the restricted diagnosis of *Apanthura*, as given by Poore and Lew Ton (in press), especially in having pleonites 1–5 fused, and pleonite 6 free.

Two species of *Apanthura* have been recorded from the Caribbean, viz., *A. geminsula* Kensley and *A. signata* Menzies and Glynn. The former is a robust species and differs from *A. cracentis* in five easily detectable features: total body length (*A. cracentis* adult up to 4.6 mm, *A. geminsula* adult about 8.0 mm); pereopod 1 structure in the male and female (carpus and propodus each bearing an acute tooth in *A. cracentis*); a markedly more setose tailfan in the present species; a shorter and broader maxillipedal endite; and a well-defined pit on pereonites 4–6 in *A. geminsula*, absent in the present species. *Apanthura signata* lacks triangular teeth on pereopod 1, which also possesses a more expanded propodus, possesses integumental pigmentation, and has relatively larger eyes. *Apanthura magnifica* Menzies and Frankenberg, known from Georgia and Florida, is an even more robust and larger species, with an indurate posteriorly flattened telson. *Apanthura signata* Paul and Menzies, from Venezuela, has an unnotched uropodal exopod and lacks teeth on the carpus and propodus of pereopod 1.

ETYMOLOGY.—The specific epithet is derived from the Latin *cracentis* (slender) and refers to the overall body form of the species.

Genus *Pendanthura* Menzies and Glynn, 1968

Pendanthura hendleri, new species

FIGURE 11

MATERIAL EXAMINED.—*Holotype*: USNM 211224, ovig ♀, TL 3.3 mm, sta H(81)-11, from

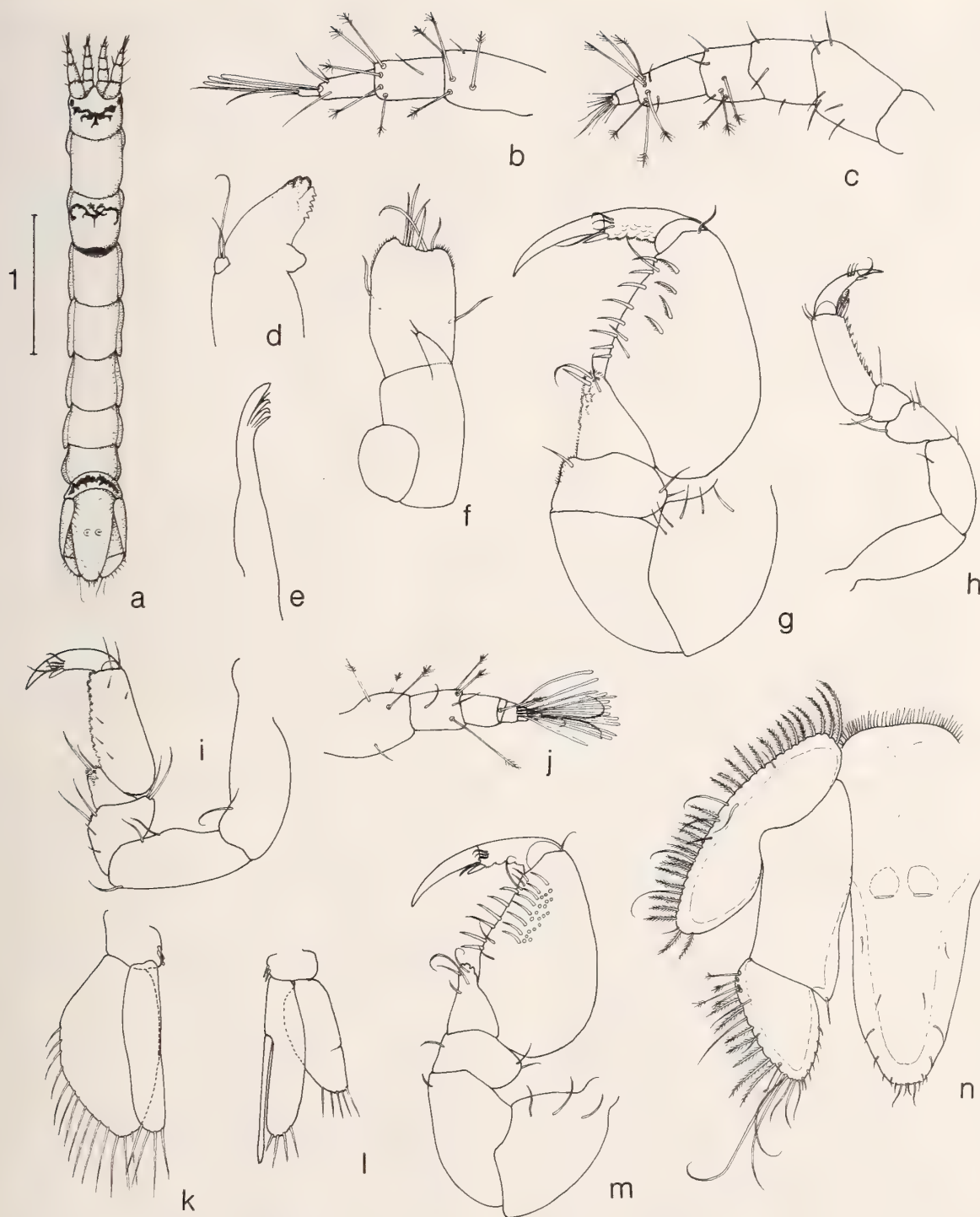


FIGURE 11.—*Pendantthura hendleri*, new species: *a*, whole animal, dorsal view; *b*, antenna 1, ♀; *c*, antenna 2; *d*, mandible; *e*, maxilla; *f*, maxilliped; *g*, pereopod 1, ♀; *h*, pereopod 7; *i*, pereopod 2; *j*, antenna 1, ♂; *k*, pleopod 1; *l*, pleopod 2, ♂; *m*, pereopod 1, ♂; *n*, telson and uropod.

Madracis sp. coral on reef slope, 15.2 m.

Allotype: USNM 211225, ♂, TL 2.8 mm, sta K-145, coarse rubble on reef slope, 23 m.

Paratypes: USNM 211226, ovig ♀, TL 3.1 mm, 2 non-ovig ♀, TL 3.3 mm, 3 juvs, TL 1.8–2.1 mm, sta H(81)-11, H(81)-31, H(81)-35, from *Agaricia* sp., *Madracis* sp., and *Porites* sp. corals on reef slope and spur and groove, 9.1–15.2 m. USNM 211227, ♂, TL 3.0 mm, sta K-35, coarse coral rubble on reef slope, 20 m. USNM 211228, ovig ♀, TL 3.4 mm, sta *Alpha-Helix* ND-19, off Panama, 30 m. USNM 211229, ♂, TL 2.9 mm, juv, TL 1.8 mm, sta H(81)-1, Twin Cays, Belize, from *Caulerpa verticillata* under red mangroves, 0–2 m.

DESCRIPTION.—*Ovigerous Female:* Integument not indurate. Body $8\frac{1}{2}$ times longer than wide; proportions: $C < 1 > 2 < 3 = 4 = 5 > 6 > 7 > P$. Head with triangular rostrum extending well beyond anterolateral lobes; dorsolateral eyes small, well pigmented. Strong dorsal articulation-hollow between pereonites 2 and 3. Pleon about half length of pereonite 7. Telson basally broad, tapering in posterior half to truncate-rounded apex; 2 statocysts at about midlength; broad hyaline margin in posterior half.

Antenna 1 with 3-segmented peduncle, segments decreasing in width and length distally; segment 3 with single aesthetasc; flagellum consisting of single tiny article bearing 2 aesthetascs. Antenna 2 with peduncle segment 2 longest and broadest; flagellum consisting of 1 small and 1 tiny setose article. Mandibular palp consisting of single short segment bearing 2 setae; incisor of 3 cusps; lamina dentata of 5 serrations; molar short and blunt. Maxilla with 1 strong and 4 smaller distal spines. Maxillipedal palp of single broad quadrate segment bearing 6 distal setae; endite short, conical, with 2 distal setae. Pereopod 1 with triangular carpus bearing fringed scales on posterior and distal margins; propodus broad, expanded, palmar margin very gently convex, bearing 8 simple spines, medial face with 4 fringed spines; unguis equal in length to rest of dactylus, with strong accessory spine at base; posterior surface bearing fringed scales. Pereo-

pod 2, carpus and propodus with fringed scales on posterior surfaces; propodus roughly rectangular. Pereopod 7, merus distally broadened; carpus with anterior margin shorter than posterior; propodus rectangular, posterior margin bearing fringed scales, posterodistal angle with 3 fringed spines. Pleopod 1, exopod operculiform, 3 times wider than and subequal in length to endopod, both rami bearing marginal plumose setae. Uropodal exopod narrowly oval, just reaching base of endopod, fringed with plumose and simple setae; endopod triangular, distally narrowly rounded, bearing plumose and elongate simple setae.

Male: Antenna 1, flagellum of 4 short articles bearing numerous aesthetascs. Pereopod 1 as in female but with cluster of simple spines on medial surface of propodus. Pleopod 2, endopod with copulatory stylet articulating in proximal half of medial margin, extending well beyond ramus; exopod $\frac{1}{3}$ shorter than endopod, with faint indication of suture on outer margin.

Color: Body transparent in life, with dorsal reticulation of red-brown pigment on head, pereonite 2, and pleon.

REMARKS.—Two species of *Pedanthura* have been described, viz., *P. tanaiformis* Menzies and Glynn, the type-species, from Puerto Rico, and *P. rarotonga* Kensley, from the Cook Islands in the Pacific. *Pedanthura rarotonga* is very similar to the present species in overall proportions and in most of the appendage structures. The most noticeable differences lie in the first pereopod, which is sinuous in the Pacific species, gently convex in *P. hendleri*, and in the telsonic shape, being broader and less tapered in *P. rarotonga*.

Pedanthura tanaiformis has been recorded from Puerto Rico (Menzies and Glynn, 1968) and from Belize (Kensley, 1982) and is abundant on the same reef from which *P. hendleri* was collected. The color pattern, however, easily separates the two species, *P. tanaiformis* being dorsally heavily pigmented on the head, pereon, and pleon, and *P. hendleri* having three narrow dorsal patches of pigment. Other differences lie in the mandible (the palp having a single seta in the

earlier species), the maxilliped (relatively more elongate in *P. hendleri*), and pereopod 1, which has a distinct, rounded lobe on the propodal palm in the male and female of *P. tanaiformis*.

The two Caribbean species also show a differential depth distribution, *P. tanaiformis* being abundant in intertidal rubble habitats and rarely recorded below 1 m. *Pendanthura hendleri* has been collected in 1–2 m in algal turf under red mangroves and in several coral species on the reef slope, to a depth of 30 m.

ETYMOLOGY.—The species is named for Dr. Gordon Hendler, of the Smithsonian Institution, who collected most of the specimens and who also has contributed many other isopod specimens to this study.

Suborder FLABELLIFERA

Family SPHAEROMATIDAE

Genus *Cymodoce* Leach, 1814

Cymodoce ruetzleri, new species

FIGURES 12–14

MATERIAL EXAMINED.—*Holotype*: USNM 211230, ♂, TL 5.0 mm, sta F-48, rubble flats, 0.7 m.

Allotype: USNM 211231, ovig ♀, TL 4.0 mm, sta CBC-7.5.74-1, 0.5 m.

Paratypes: USNM 211232, 6 ♂, TL 4.0–4.5 mm, 3 ovig ♀, TL 4.0–4.2 mm, 2 ♀, TL 4.0 mm, sta CBC-2.5.74-3, 0.5 m. USNM 211233, 7 ♂, TL 4.0–4.3 mm, 4 ovig ♀, TL 4.0–4.3 mm, coarse sediments in *Thalassia* seagrass flats, 0.5 m.

Additional Material: USNM 211234, 9 ♂, 14 ♀, 4 juvs, sta K-4, K-22, K-35, K-53, K-61, K-62, K-70, K-73, coarse sediments in *Thalassia* seagrass flats, in *Dictyota* sp. clumps, coarse sand in *Halimeda* sp. clumps, coral rubble, intertidal to 30 m. USNM 211235, 16 ♂, 39 ♀, 69 juvs, sta H(80)-7, H(80)-11, H(80)-22, H(80)-31, H(80)-41, H(81)-3, H(81)-5, H(81)-39, in *Agaricia* sp. coral and *Halimeda* sp. algal clumps on fore reef,

1–36 m. USNM 211236, 6 ♂, 2 ♀, 1 juv, sta RC-7, RC-18, RC-65, RC-97, RC-112, reef crest coral, 0.1 m. USNM 211237, 2 ♂, 1 ♀, sta AC-67, AC-501, AC-519, coarse sand, and interior of sponge, 5–13 m. USNM 211238, 1 ♀, 1 juv, sta CBC-4.5.74-3, CBC-7.5.74-1, 0.5 m.

DESCRIPTION.—*Male*: Body dorsally strongly arched. Integument hard and brittle; anteriorly sparsely setose, becoming more densely setose posteriorly; entire pleotelson having numerous small tubercles, becoming obsolete anterior to pereonite 7. Head with large well-pigmented dorsolateral eyes; tiny ventrally directed rostral point on frontal ridge, separating bases of antenna 1, just touching apex of clypeus. Latter broadly U-shaped, with rounded dorsal apex; short blunt slightly divergent arms embracing labrum. Pereonite 1 with coxal plate fused, ventrally broadened, with posteriorly directed round lobe. Pereonite 1 broadest. Pereonite 7 with posterior margin faintly and broadly bilobed, lobes sometimes bearing tiny spine-like tubercles. Pleon consisting of 3 anterior fused pleonites articulating with pleotelson; free posterior margin of pleonite 3 submedially bilobed, with lateral emargination. Telson bearing submedian pair of strong conical tubercles, each having acute tip; conical tubercles flanked by low rounded setose tubercle; pleotelson sloping ventrally posterior to tubercles; apex of pleotelson trilobed, triangular outer lobes separated by deep incisions from truncate median lobe; small spinose tubercle at base of incision; outer lobes apically bearing 2 short teeth.

Antenna 1, peduncle 3-segmented, basal segment broad, indurate, setose, outer (exposed) surface flattened, segment 2 about $\frac{1}{2}$ width and $\frac{1}{3}$ length of basal segment; segment 3 twice length of segment 2, slender, cylindrical; flagellum of 11 articles; 8 distal articles each bearing single aesthetasc. Antenna 2 slightly longer than antenna 1, peduncle 5-segmented, 3 basal segments subequal in length, segment 4 about $\frac{1}{3}$ longer than segment 3, segment 5 about $\frac{1}{3}$ longer than segment 4; flagellum of 14 articles. Mandibular palp 3-segmented, basal segment

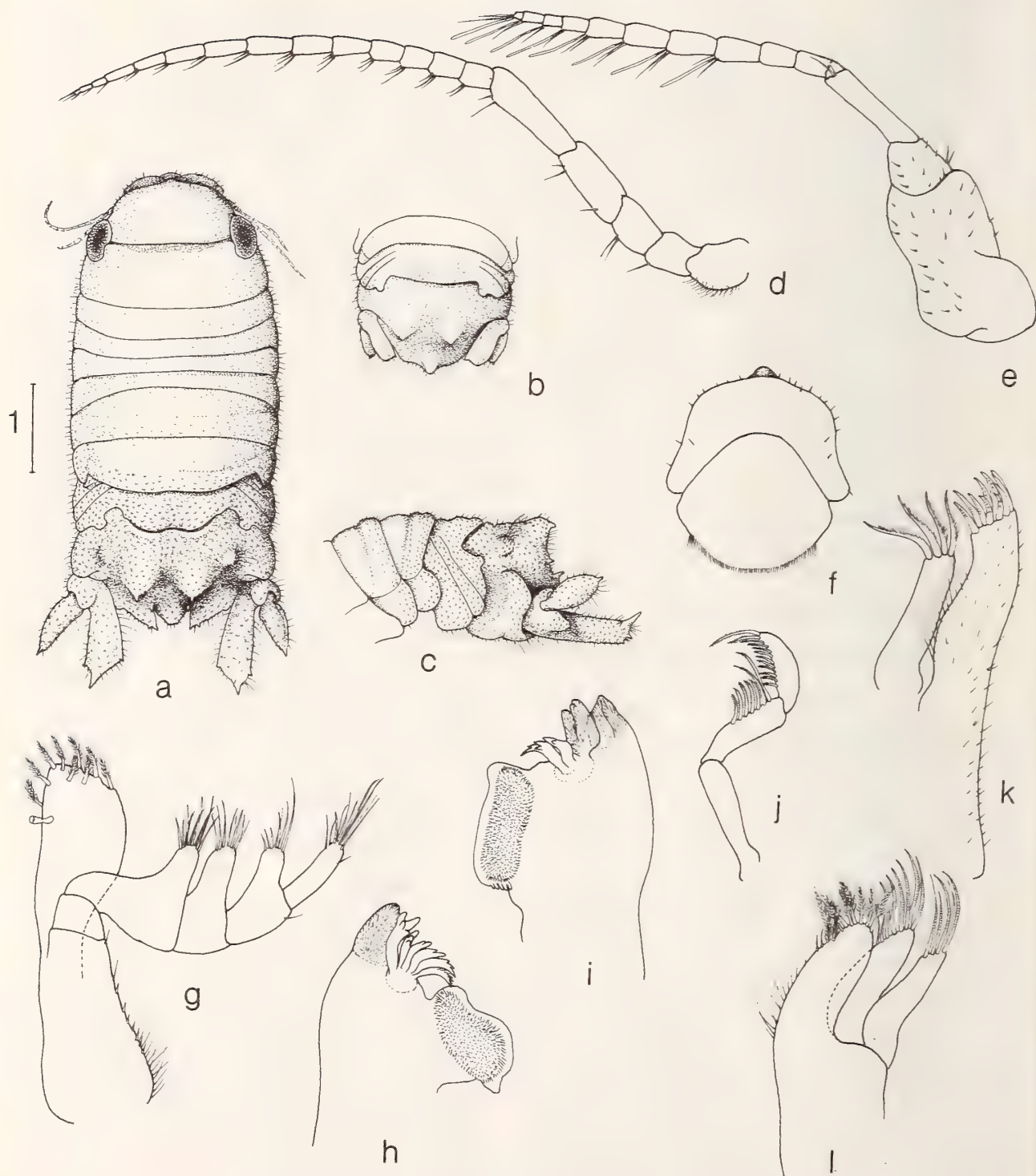


FIGURE 12.—*Cymodoce ruetzleri*, new species: a, ♂, dorsal view; b, pleotelson, ♀, dorsal view; c, pleotelson, ♂, lateral view; d, antenna 2; e, antenna 1; f, clypeus and labrum; g, maxilliped; h, left mandible; i, right mandible; j, mandibular palp; k, maxilla 1; l, maxilla 2.

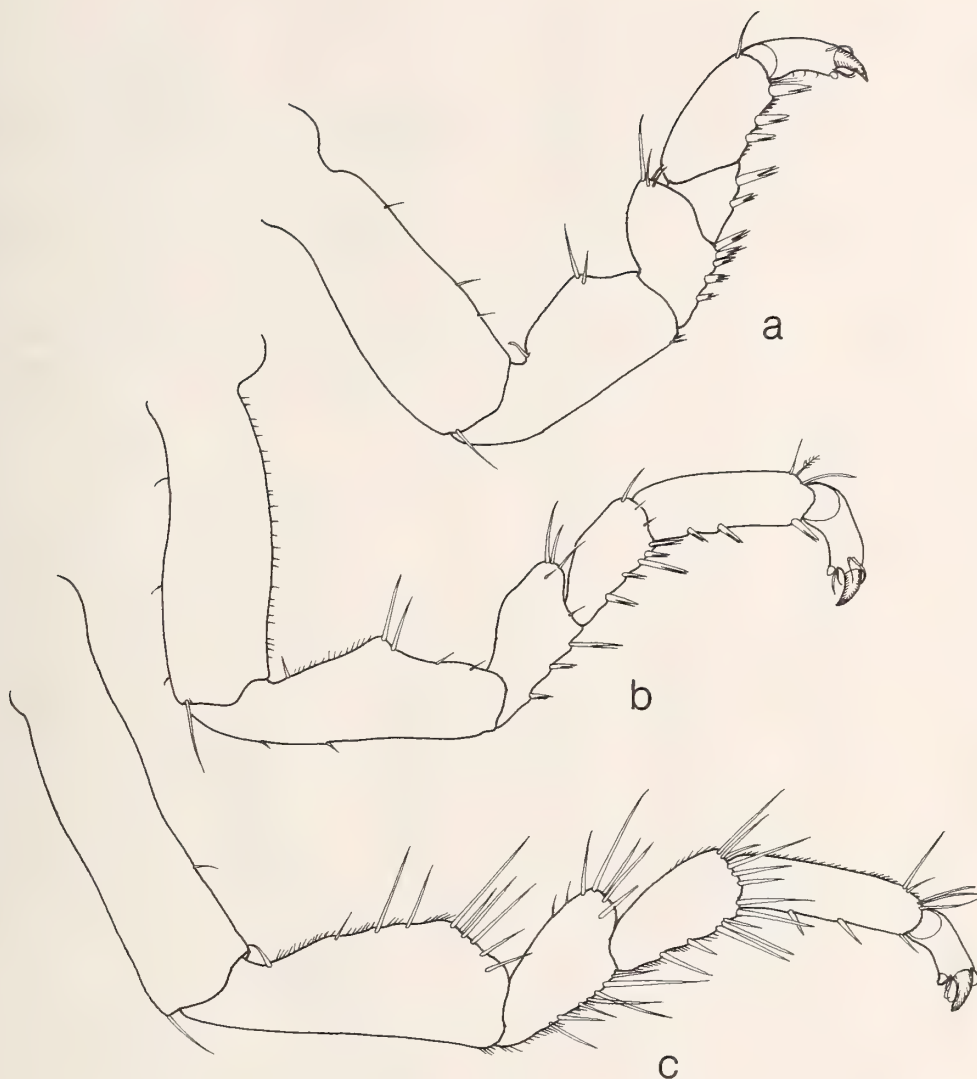


FIGURE 13.—*Cymodoce ruetzleri*, new species: a, pereopod 1; b, pereopod 2; c, pereopod 7.

longest, unarmed; segment 2 bearing 7 fringed spines; segment 3, outer margin curved, inner (median) margin bearing 12 fringed spines, 2 distal spines longest; molars of both left and right mandibles broad, with sclerotized outer margin; incisor bluntly triangular, heavily sclerotized; left mandible with 6 spines in spine row, right mandible with strongly sclerotized lacinia mobilis and 2 spines in spine row. Maxilla 1, outer ramus with 9–10 strong spines; inner ramus with 4 elongate fringed setae. Maxilla 2, inner ramus

with 8–10 fringed setae on mediodistal margin; 2 lobes of outer ramus each bearing several elongate finely ridged spines. Maxillipedal endite broadening distally, with single coupling hook, 9 short fringed setae on mediodistal margin; palp 5-segmented, segments 2–4 each with mediodistal setose lobe, terminal segment slender, setose. Pereopods increasing in length posteriorly. Pereopod 1 with short peg-like spine at base of unguis; propodus with 3 sensory spines on posterior margin; triangular carpus with 2 sensory

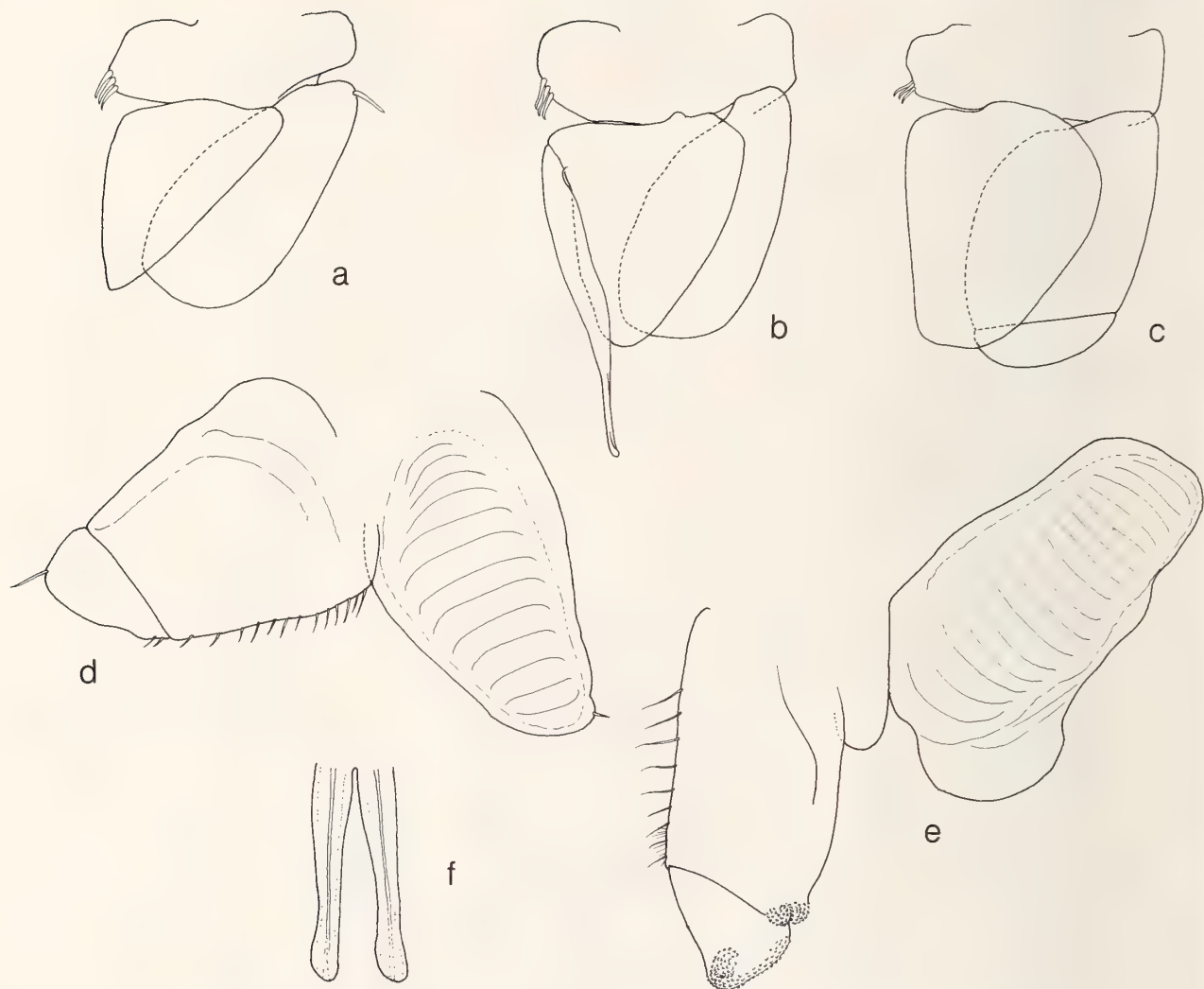


FIGURE 14.—*Cymodoce ruetzleri*, new species, ♂; a, pleopod 1; b, pleopod 2; c, pleopod 3; d, pleopod 4; e, pleopod 5; f, penis.

spines; merus with 5 sensory spines. Pereopod 2 more slender and elongate than pereopod 1; propodus with 3 posterior sensory spines; roughly rectangular carpus with 5 posterior spines; merus with 3 posterior spines. Pereopod 7 with numerous spines of varying lengths on propodus, carpus, merus, and anterior margin of ischium. Penial processes on sternal of pereonite 7 elongate-cylindrical, with slight distal swelling. Pleopod 1, basis with 3 retinacula; endopod triangular; exopod oval, distally widened. Pleopod 2, basis with 3 retinacula; endopod triangular, with copulatory stylet articulating at base, taper-

ing distally, extending well beyond apex of ramus; exopod oval, distally widened. Pleopod 3, endopod basally broad, tapering distally, apex broadly rounded; exopod broadly oval, with transverse suture in distal fourth. Pleopod 4, endopod pleated, basally broader than distally; exopod membranous, broadly triangular, with transverse suture in distal fourth. Pleopod 5, endopod pleated, with rounded basal lobe; exopod membranous, with oblique transverse suture in distal third. Uropodal endopod longer than exopod, fused with peduncle, with short lateral lobe at base near articulation of exopod; endo-

pod somewhat flattened, widening distally to triangular apex bearing strong tooth; exopod oval in cross-section, with apical tooth.

Female: Free posterior margin of pleonite 4 not bilobed as in male; pleotelson with 2 strong submedian conical apically acute tubercles; apex barely notched, having short rounded lobe slightly offset from posterior pleotelsonic margin. Uropodal endopod and peduncle fused, endopod flattened, widening distally to rounded/truncate margin, with short tooth at mediolateral corner; exopod shorter than endopod, flattened, oval, with tiny distal tooth.

REMARKS.—This species agrees on all points with the generic diagnosis of *Cymodoce*, given by Hurley and Jansen (1977:45).

No true *Cymodoce* species has hitherto been recorded from the Caribbean. *Cymodoce ruetzleri* most closely resembles *C. bentonica* Loyola e Silva, 1962, from São Paulo, Brazil, especially in the overall structure of the male and female pleotelson and in the posterior granulation of the integument. In details, however, the two species may easily be separated. The male *C. bentonica* possesses a strong anterodorsally flexed spine on the pleotelson and lacks the distinctive spines of the pleotelson tubercles and uropods seen in *C. ruetzleri*. The lobes of the male pleotelson are apically rounded, and the median lobe elongate in the Brazilian species, whereas in *C. ruetzleri* the outer lobes are spinose, the medial lobe less elongate and apically truncate. The pleotelsonic tubercles of the female are acute in the new species, rounded in the Brazilian species.

ETYMOLOGY.—The species is named for Dr. Klaus Rützler, coordinator of the Smithsonian IMSWE program in Belize.

Genus *Dynamenella* Hansen, 1905

Dynamenella quadrilirata, new species

FIGURES 15, 16

MATERIAL EXAMINED.—**Holotype:** USNM 211239, 1 ♂, TL 2.6 mm, sta CBC-4.5.74-3, from sponge, 0.5 m.

Allotype: USNM 211240, ovig ♀, TL 2.5 mm,

sta CBC-4.5.74-3, from sponge, 0.5 m.

Paratypes: USNM 211241, 6 ♂, TL 2.1–2.5 mm, 17 ovig ♀, 2.1–2.5 mm, 5♀, sta CBC-2.5.74-2, from sponge, 0.5 m. USNM 211242, 1 ♂, TL 2.4 mm, sta F-21, Twin Cays, *Caulerpa verticillata* mat under red mangroves, 0.2 m. USNM 211243, 1♂. TL 2.4 mm, 1 ovig ♀, TL 2.5 mm, 2 juvs, sta AC-147, coral rubble in upper spur and groove, 3 m.

DESCRIPTION.—**Male:** Body dorsally strongly arched. Integument indurate. Dorsolateral eyes well pigmented. Head faintly tuberculate, with tiny rostral point touching apex of clypeus, separating bases of antenna 1. Clypeus U-shaped, with stubby arms embracing labrum. Coxal plate 1 fused to pereonite, vental margin straight, anteriorly triangular under eye, posteriorly narrowed. Pereonite 1 longest, dorsally with roughened integument. Pereonites 2–7 each with roughened transverse band in posterior half. Fused pleonite section with 2 low rounded submedian tubercles. Pleotelson with anterior half inflated, bearing 4 strong rounded ridges; tapering posteriorly to deeply notched apex; ventral margins of apical notch not contiguous, notch cordate, with low rounded lobe on midline.

Antenna 1, first peduncle segment wider, but subequal in length to 2 distal segments; segment 3 narrow, cylindrical, 1½ times longer than segment 2; flagellum of 8 articles, articles 3–6 each with single aesthetasc. Antenna 2 slightly shorter than antenna 1, peduncle segments increasing in length distally; flagellum of 8 articles. Mandibular palp 3-segmented, basal segment longest; segment 2 with 4 fringed spines increasing in length distally; segment 3 with 9 fringed spines increasing in length distally. Left mandible with 3-cusped incisor; lacinia mobilis not sclerotized, with 2 rounded basal cusps; spine row with 1 broad and 2 fringed spines; molar ridged, with numerous marginal teeth. Right mandible with 4-cusped incisor; lacinia mobilis sclerotized, with 3 cusps; spine row of 5 fringed spines. Maxilla 1, inner ramus with 4 elongate fringed setae; outer ramus with 10 stout spines, some faintly dentate. Maxilla 2, inner ramus with 6 spines on mediolateral margin, 2 of these stout, conspicuously

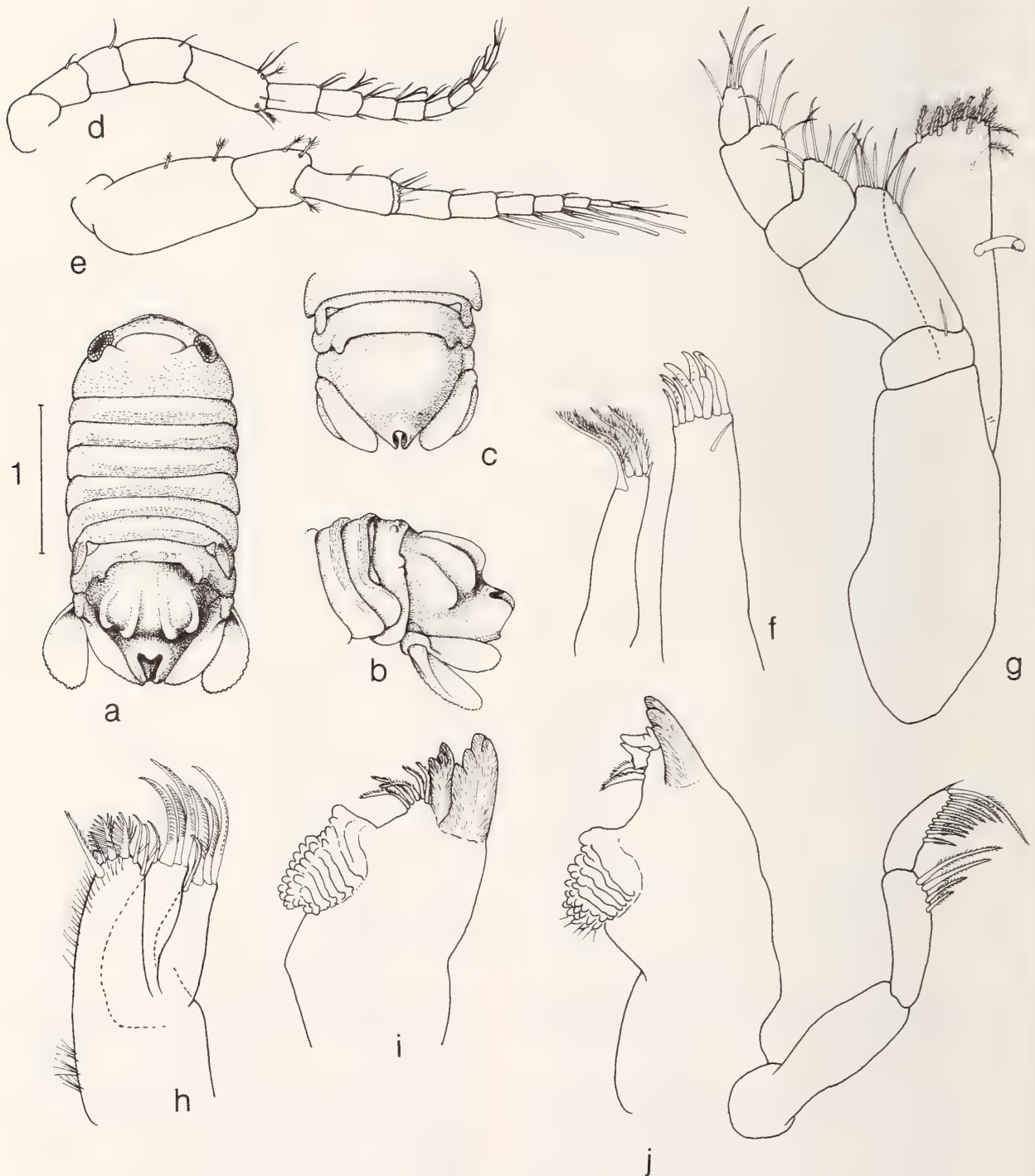


FIGURE 15.—*Dynamenella quadrilirata*, new species: *a*, ♂, dorsal view; *b*, pleotelson, ♂, lateral view; *c*, pleotelson, juvenile, dorsal view; *d*, antenna 2; *e*, antenna 1; *f*, maxilla 1; *g*, maxilliped; *h*, maxilla 2; *i*, right mandible (pulp omitted); *j*, left mandible.

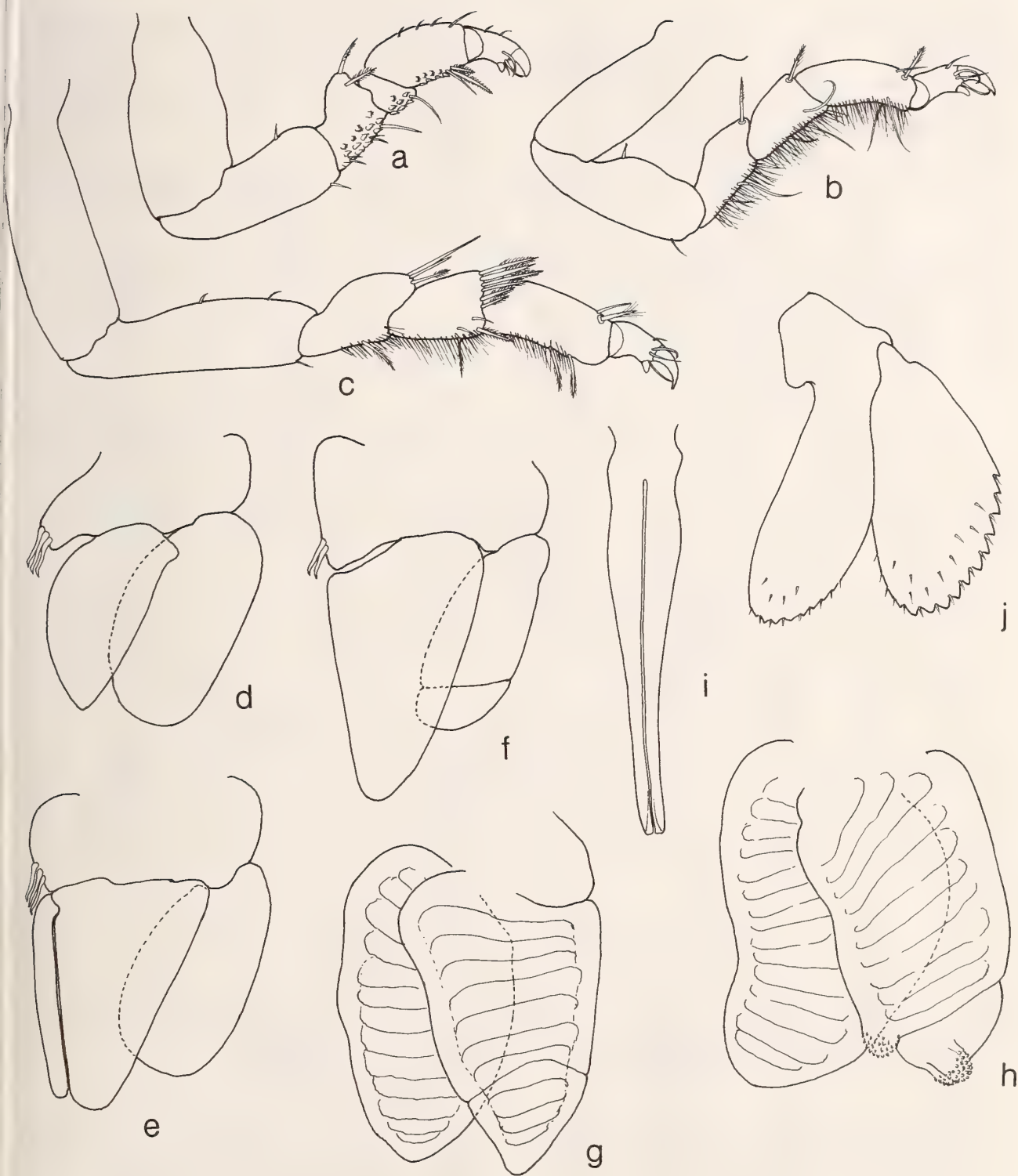


FIGURE 16.—*Dynamenella quadrilirata*, new species: *a*, pereopod 1; *b*, pereopod 2; *c*, pereopod 7; *d*, pleopod 1; *e*, pleopod 2, ♂; *f*, pleopod 3; *g*, pleopod 4; *h*, pleopod 5; *i*, penis; *j*, uropod.

fringed; both lobes of outer ramus each with 4 stout ridged and dentate spines. Maxillipedal endite with single coupling hook; mediobasal margin with 2 fringed setae; distal margin with 9 fringed spines; palp 5-segmented, segment 2 longest, distally setose; segment 3 with triangular mediobasal setose lobe. Pereopod 1 with strong unguis and accessory spine on dactylus; propodus with 3 posterodistal spines, posterior surface bearing short ctenoid scales; posterior surface of short carpus and merus bearing spinose scales. Pereopod 2 with numerous setules on posterior surfaces of propodus, carpus, and merus. Pereopod 7, posterior surfaces of propodus, carpus and merus with numerous fine setules; carpus with 6 anterodistal fringed spines. Penial processes on midline of pereonite 7 slender, elongate, basally fused. Pleopod 1, basis with 3 retinacula; endopod distally subacute, shorter than oval exopod. Pleopod 2, basis with 3 retinacula; endopod triangular, with cylindrical copulatory stylet articulating at base; exopod oval, shorter than endopod. Pleopod 3, endopod triangular, considerably longer than oval exopod; latter with obliquely transverse suture in distal third. Pleopod 4, both rami pleated; exopod tapering apically, with distal transverse suture. Pleopod 5, both rami pleated; exopod with transverse suture in distal fourth, with 3 rounded distal spinulose bosses; endopod broadly oval. Uropodal rami subequal in length, distal margins dentate; exopod broader than endopod, with ventral surface bearing small scattered tubercles.

Female: Immature (TL 2.0 mm) pleotelson anteriorly inflated, but lacking sculpture; apex notched, forming short open tube, ventral margins not touching, foramen circular. Oviparous (TL 2.5 mm) pleotelson with 4 rounded ridges somewhat less raised than in male; apical foramen circular.

REMARKS.—None of the ± 12 species of *Dynamenella* recorded from Puerto Rico (Menzies and Glynn, 1968), Panama (Glynn, 1968), Venezuela (Glynn, 1970), or Brazil (Loyola e Silva, 1960) show the strong 4-ridged pleotelson of *D. quadrilirata*. *Dynamenella condita* Hurley and Jan-

sen, from New Zealand, possesses six longitudinal ridges on the pleotelson, but these ridges are not so pronounced as in the present species. This unique sculpture demands the erection of a new species.

ETYMOLOGY.—The specific epithet, taken from the Latin *quattuor* (four) plus *lira* (ridge), refers to the pleotelsonic sculpture.

Genus *Paracerceis* Hansen, 1905

Paracerceis cohenae, new species

FIGURES 17, 18

MATERIAL EXAMINED.—*Holotype*: USNM 211244, ♂, TL 10.0 mm, sta AC-526c, from sponge *Callispongia plicifera* on outer ridge of fore reef, 15 m.

Allotype: USNM 211245, ♀, TL 7.9 mm, sta AC-526c, from sponge *Callispongia plicifera* on outer ridge of fore reef, 15 m.

Paratypes: USNM 211246, 2 ♀, TL 7.0, 6.0 mm, 10 juvs, TL 3.2–5.8 mm, sta AC-347, from sponge *Callispongia plicifera* on outer ridge of fore reef, 16 m. USNM 211247, ♀, TL 6.2 mm, 3 juvs, from sponge *Callispongia plicifera* on outer ridge of fore reef, 15 m.

DESCRIPTION.—*Male*: Body dorsally moderately arched. Integument indurate, brittle, not setose (except uropods). Dorsolateral eyes well pigmented. Head with small ventrally directed rostral point, separating bases of antenna 1, not touching apex of clypeus; low middorsal tubercle near posterior margin. Clypeus with bulbous apex, arms parallel-sided, divergent, apically rounded, embracing labrum. Pereonites each with rounded middorsal tubercle and several lateral tubercles near posterior margin. Coxal plate of pereonite 1 posteriorly lobed, rounded, tapering anteriorly under eye. Coxal plates 2–7 with 2 or 3 rounded tubercles, posteroventral corners rounded. Four fused pleonites with large conical middorsal tubercle near posterior margin, several smaller lateral tubercles. Pleotelson with anterior $\frac{2}{3}$ inflated, faintly tripartite, marked posteriorly by transverse ridge bearing strong mid-

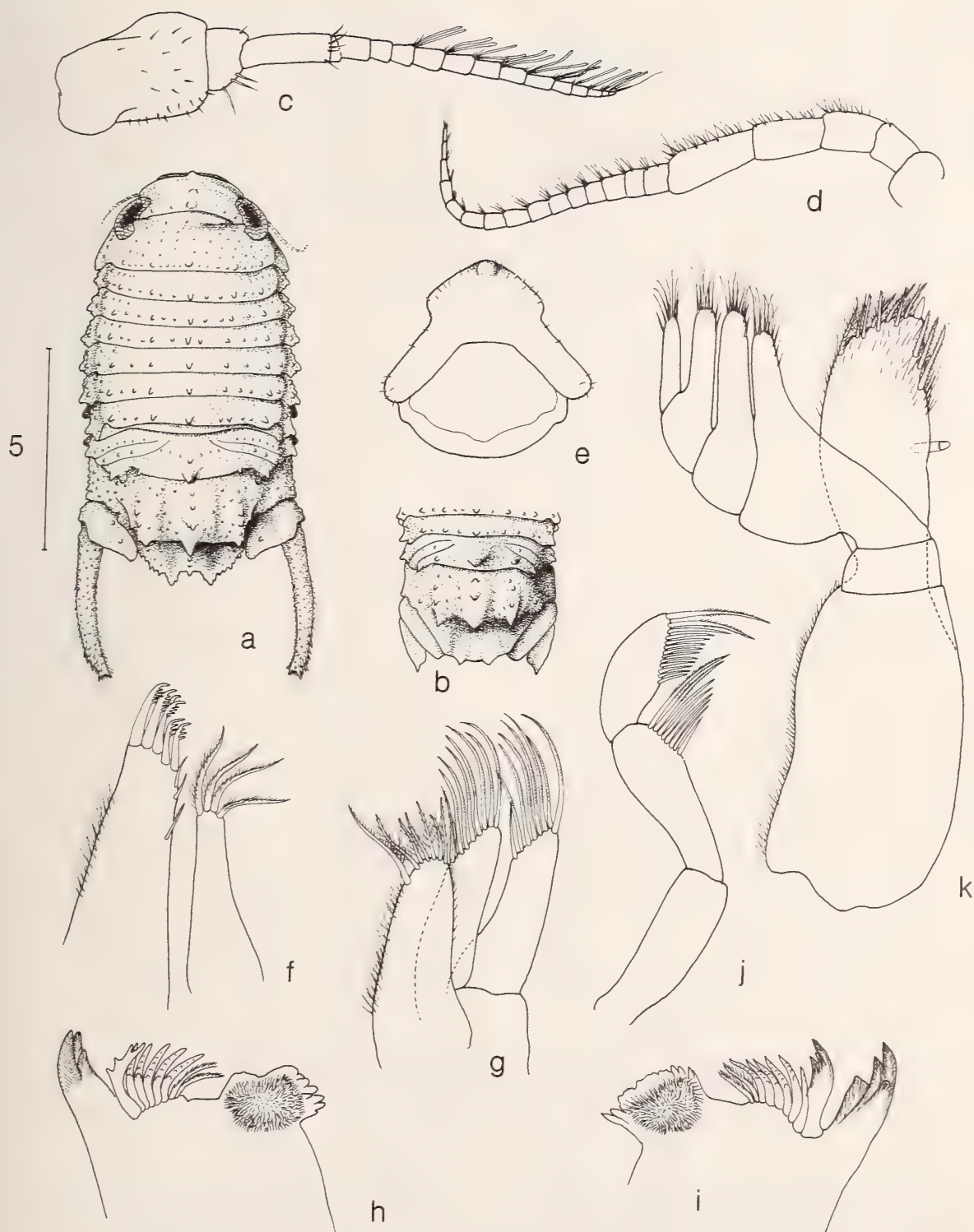


FIGURE 17.—*Paracerceis cohenae*, new species: *a*, ♂, dorsal view; *b*, pleotelson, ♀, dorsal view; *c*, antenna 1; *d*, antenna 2; *e*, clypeus and labrum; *f*, maxilla 1; *g*, maxilla 2; *h*, left mandible; *i*, right mandible; *j*, mandibular palp; *k*, maxilliped.

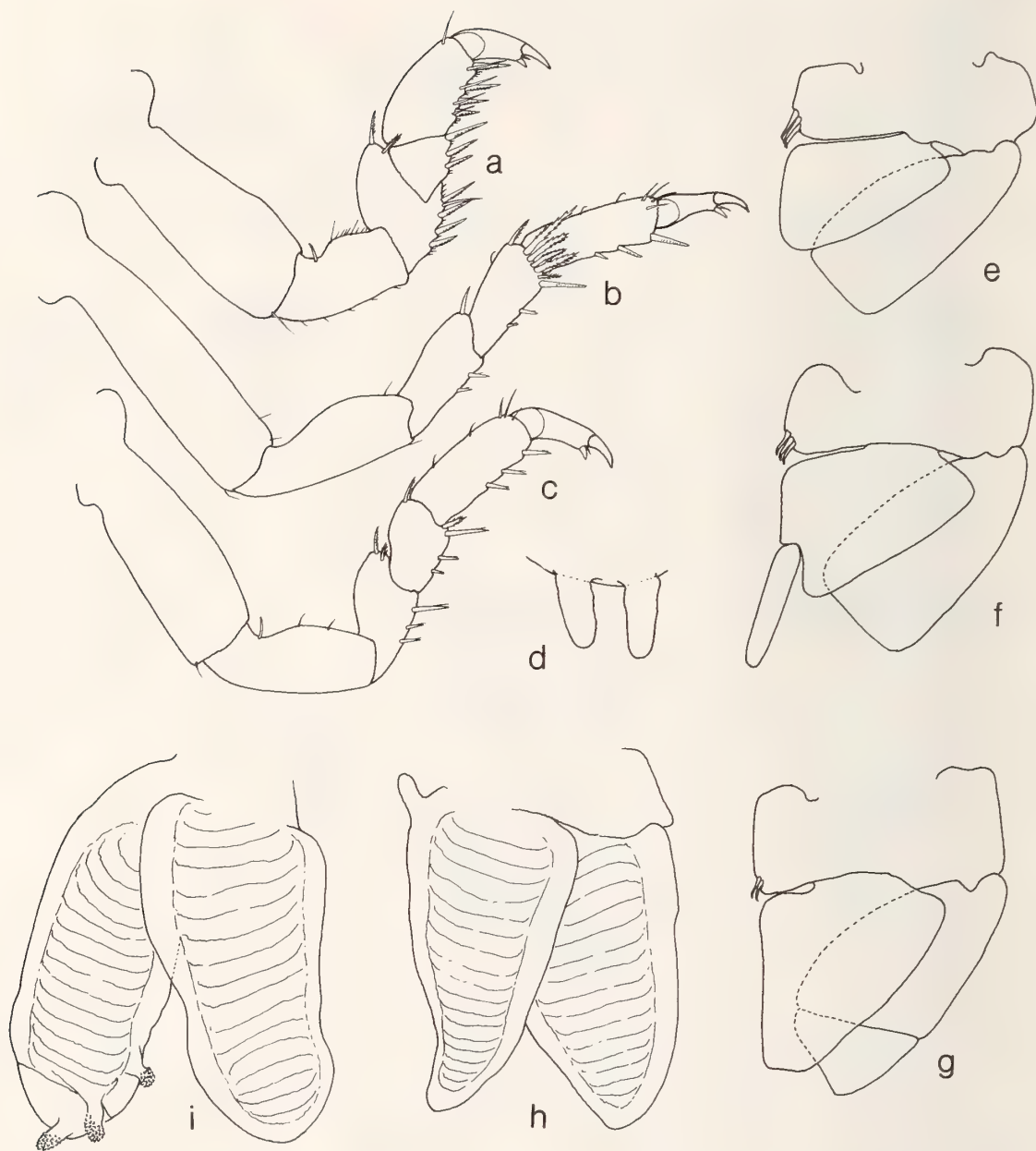


FIGURE 18.—*Paracerceis cohenae*, new species: a, pereopod 1; b, pereopod 7; c, pereopod 2; d, penis; e, pleopod 1; f, pleopod 2, ♂; g, pleopod 3; h, pleopod 4; i, pleopod 5.

dorsal and lateral conical tubercles; numerous smaller tubercles present, especially laterally; posterolateral margins curved, toothed; apex notched, with small median tooth, notch flanked by triangular toothed lobes.

Antenna 1, basal segment indurate, outer

(exposed) surface flattened, anteromedially rounded; segment 2 about $\frac{1}{4}$ length and $\frac{1}{2}$ width of basal segment; segment 3 slender, cylindrical, twice greatest length of segment 2; flagellum of 14 articles, 11 distal articles each bearing 1 or 2 aesthetascs. Antenna 2, segment 1 broadest; seg-

ments 2–5 cylindrical, increasing in length; flagellum of 15 setose articles. Mandibular palp 3-segmented, middle segment longest, bearing 8 mediobasal fringed spines; distal segment, outer margin convex, 13 fringed spines on inner distal margin, spines becoming longer distally. Left mandible, incisor with 3 subacute sclerotized cusps; lacinia mobilis bluntly dentate; 7 spines in spine row; molar broadly convex, with sclerotized, toothed outer margin; right mandible, incisor with 4 sclerotized cusps; lacinia mobilis with 3 sclerotized cusps; 8 spines in spine row. Maxilla 1 inner ramus with 4 elongate fringed setae; outer ramus with 6 strongly dentate distal spines. Maxilla 2, inner ramus with 7 fringed spines on mediobasal margin; both lobes of outer ramus each bearing 8 elongate curved spines. Maxillipedal endite with single coupling hook, 3 fringed spines on medial margin, mediobasal apex bearing strong tooth-like spine; outer distal margin bearing 8 fringed spines; palp 5-segmented, segments 2–4 with mediobasal setose lobes, segment 5 slender, setose. Pereopods increasing in length posteriorly. Pereopod 1 propodus, triangular carpus, and merus bearing fringed spines on posterior margins. Pereopod 2 with few sensory spines on posterior margins of propodus, carpus, and merus. Pereopod 7 with few spines on posterior margin; inner distal margin of carpus bearing 4 stout fringed spines. Penial processes on midventral sternite of pereonite 7 short, digitiform. Pleopod 1, basis with 3 retinacula; endopod roughly triangular; exopod broadening to truncate distal margin. Pleopod 2, endopod with rod-shaped copulatory stylet articulating slightly beyond midlength of medial margin; exopod as in pleopod 1. Pleopod 3, endopod triangular; exopod broadening to distal truncate margin, with obliquely transverse suture in distal $\frac{1}{3}$. Pleopod 4, both rami pleated, triangular. Pleopod 5, both rami pleated, less triangular than in pleopod 4, with 3 spinulose bosses. Uropod with peduncle and endopod fused; endopod distally rounded, not reaching pleotelsonic apex; exopod elongate, cylindrical, slightly bowed towards midline, becoming granular and setose distally, apically truncate, spinose.

Female: Head and pereon very similar to male. Clypeus lacking bulbous apex. Pleotelson with anterior half inflated, faintly tripartite, with strong conical spine at posterior end of each portion; apex shallowly notched, notch flanked by 2 low triangular lobes. Uropod with exopod flattened, slightly overreaching pleotelsonic apex, ending in distolateral tooth; endopod and peduncle fused, ramus flattened, distally rounded, slightly shorter than exopod.

REMARKS.—See "Remarks" section of *Paracerceis glynni*.

ETYMOLOGY.—The species is named for Anne Cohen, recently of the Smithsonian Institution, who collected all the material of this species at Carrie Bow Cay, Belize.

Paracerceis glynni, new species

FIGURES 19, 20

MATERIAL EXAMINED.—*Holotype:* USNM 211248, ♂, TL 6.4 mm, coll. W.A. Starck, Jr., $\frac{1}{3}$ mi S of Alligator Light, Monroe County, Florida, 11 m.

Paratypes: USNM 122742, 3 ♀, TL 4.4, 5.0, 5.2 mm, coll. W.A. Starck, Jr., $\frac{1}{3}$ mi S of Alligator Light, Monroe County, Florida, 11 m. USNM 211249, ♂, TL 5.8 mm, sta H(81)-3, From *Halimeda* sp. on fore reef crest, 15.2 m. USNM 211250, ♂, TL 5.8 mm, sta K-142, from sponge *Aplysina fistularis* on fore reef slope, 11 m.

DESCRIPTION.—*Male:* Body dorsally strongly arched. Integument indurate, brittle, anteriorly sparsely setose, becoming densely setose posteriorly. Dorsolateral eyes well pigmented. Head smooth, with small rostral point separating bases of antenna 1, touching apex of clypeus. Clypeus apically subacute, divergent arms embracing labrum short, distally rounded. Pereonites 1–4 dorsally smooth. Pereonites 5–7 becoming progressively more tuberculate, tubercles becoming more acute posteriorly. Anterior 4 fused pleonites tuberculate. Pleotelson with numerous scattered small tubercles, anterior half inflated, posterior margin of inflated part marked by strong middorsal conical tubercle and smaller acutely

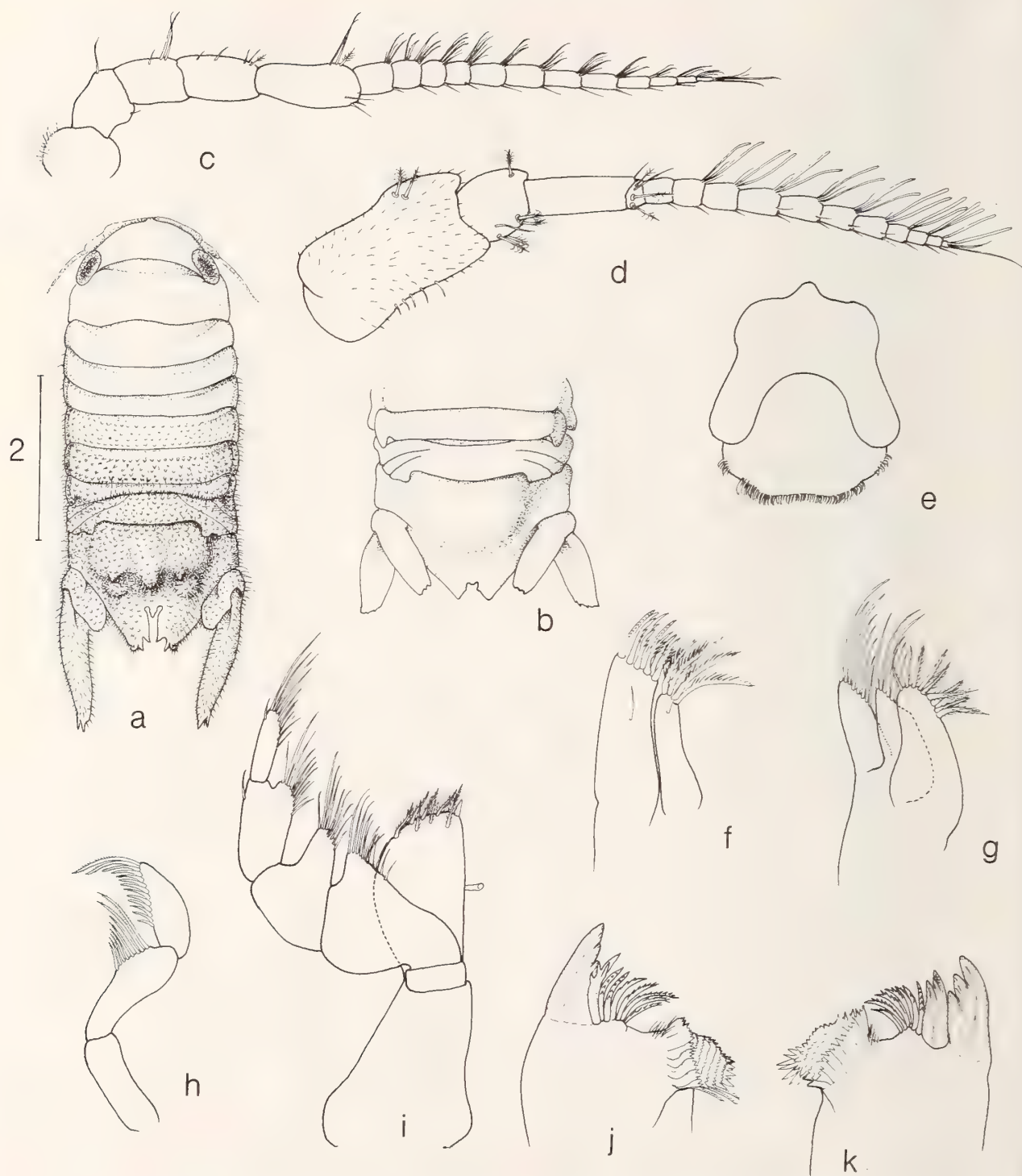


FIGURE 19.—*Paracerceis glynni*, new species: *a*, ♂, dorsal view; *b*, pleotelson, ♀, dorsal view; *c*, antenna 2; *d*, antenna 1; *e*, clypeus and labrum; *f*, maxilla 1; *g*, maxilla 2; *h*, mandibular palp; *i*, maxilliped; *j*, left mandible; *k*, right mandible.

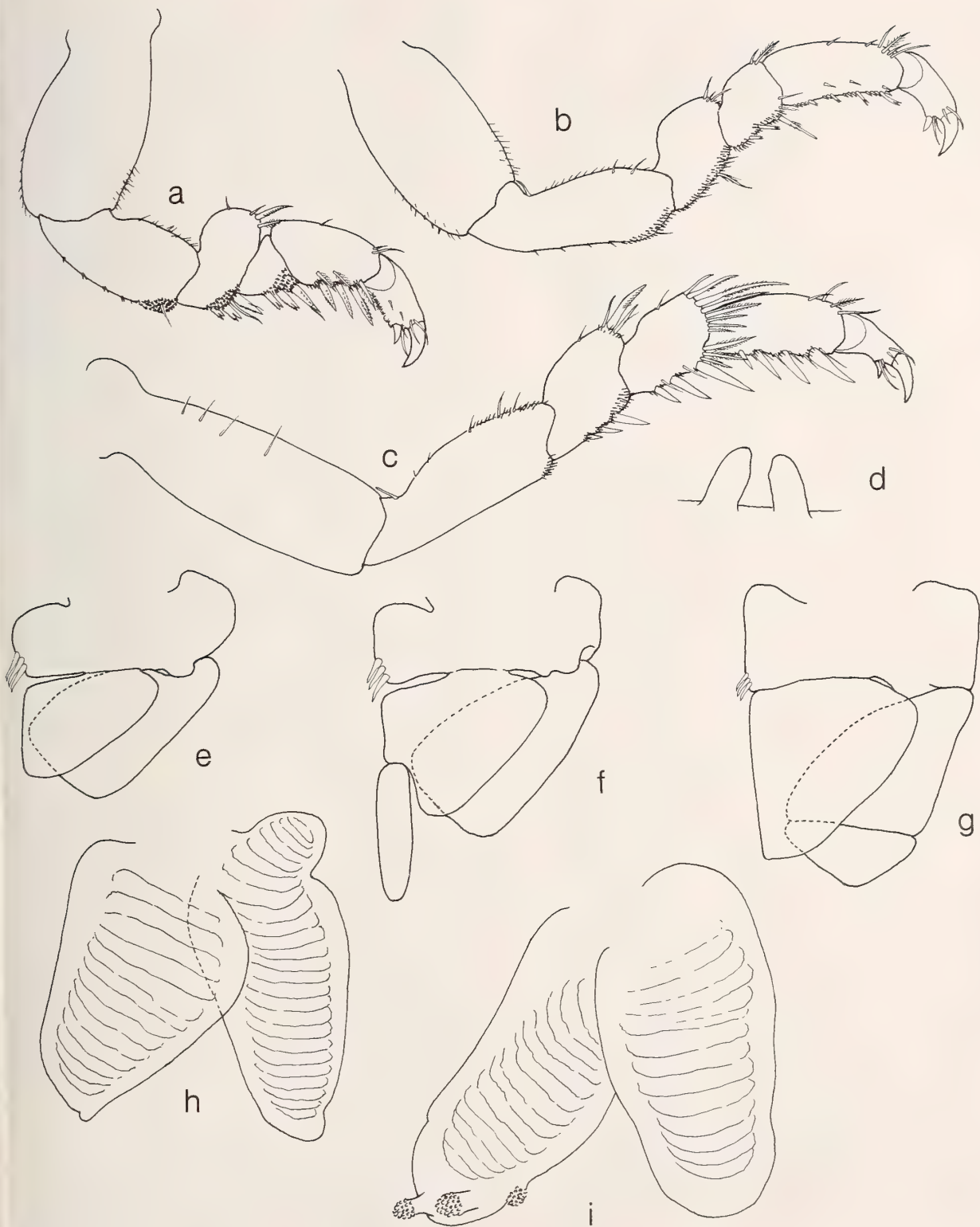


FIGURE 20.—*Paracerceis glynni*, new species: a, pereopod 1; b, pereopod 2; c, pereopod 7; d, penis; e, pleopod 1; f, pleopod 2, ♂; g, pleopod 3; h, pleopod 4; i, pleopod 5.

conical lateral tubercle; low rounded bulge beneath and posterior to strong lateral tubercle; posterior half of pleotelson deeply cleft, with small median tooth at base of notch, lobes forming notch apically tricuspid, outer cusp curved dorsally. Coxal plate of pereonite 1 posteroventrally triangular, tapering anteriorly, narrow beneath eye.

Antenna 1, setose basal peduncle segment subequal in length to 2 distal segments combined but considerably broader; segment 2 $\frac{2}{3}$ length of narrower segment 3; flagellum of 12 articles, articles 3–10 each with 2 aesthetascs, articles 11–12 with single aesthetasc. Antenna 2, peduncle 5-segmented, segment 5 longest; flagellum of 12 setose articles. Mandibular palp 3-segmented, segment 2 longest, bearing 8 fringed spines becoming longer distally; segment 3 bearing 13–14 fringed spines becoming longer distally; left mandible, incisor sclerotized, of 3 cusps; lacinia mobilis not sclerotized, with 3 strong teeth; 7 spines in spine row; molar broad, with several distally toothed plates forming crushing surface, with longer spines on periphery. Right mandible with tridentate incisor; lacinia mobilis sclerotized; 7 spines in spine row; molar as in left mandible. Maxilla 1, outer ramus bearing 7–9 dentate distal spines; inner ramus with 4 elongate distal fringed setae. Maxilla 2, inner ramus with 9 spines on mediodistal margin; both lobes of outer ramus bearing about 8 elongate slender finely fringed spines. Maxillipedal endite with single coupling hook on median margin, 8 fringed spines on distal margin, single spine at mediodistal angle; palp 5-segmented, segment 1 short, segment 2 with setose triangular lobe on median margin, segment 3 with setose lobe becoming digitiform, segment 4 with setose lobe very short, segment 5 slender, terete, setose. Pereopods becoming longer posteriorly. Pereopod 1 with unguis and accessory spine of dactylus sclerotized; propodus with 3 strong dentate spines on posterior margin, 3 fringed spines on outer surface; triangular carpus, and merus with 3 strong dentate spines on posterior margin;

carpus, merus, and ischium each with postero-distal patch of scales. Pereopod 2, propodus with 4, carpus with 3, and merus with 1 sensory spines on posterior margin. Pereopod 7, propodus with 4 strong spines on posterior; carpus with 3 strong spines on posterior margin, several fringed spines of varying length on distodorsal margin; merus with 3 spines on posterior margin, 1 strong fringed spine and 2 slender spines on distodorsal margin. Penial processes on sternite of pereonite 7 relatively short and blunt, well separated. Pleopod 1, basis with 3 retinacula at mediodistal angle; endopod triangular; exopod widening to distal truncate margin. Pleopod 2, basis with 3 retinacula; endopod distally tapering to broadly rounded apex, cylindrical copulatory stylet extending well beyond apex of ramus, articulating at about midlength of median margin; exopod widening to distal truncate margin. Pleopod 3, basis with 3 retinacula; endopod triangular; exopod widening distally, with oblique suture in distal $\frac{1}{3}$. Both rami of pleopods 4 and 5 pleated. Uropodal endopod and peduncle fused, ramus distally rounded, reaching to about midlength of distolateral pleotelsonic margin; exopod elongate-cylindrical, faintly sinuous, apically bicus-pate, extending by about $\frac{1}{2}$ its length beyond pleotelsonic apex.

Female: Body markedly less setose than in male, integument not tuberculate. Pleotelson with strongly inflated hemispherical proximal half with very faint indication of tubercle posteriorly; apex notched, with low rounded tooth at base of notch; lobes flanking notch triangular. Uropodal endopod and peduncle fused; endopod flattened, reaching just beyond midlength of distolateral pleotelsonic margin, apically faintly tributerculate; exopod just extending beyond pleotelsonic apex, flattened, with few faint tubercles mediodistally.

REMARKS.—Four species of *Paracerceis* are known from the western Atlantic.

Paracerceis tomentosa Schultz and McCloskey, 1967, was described from three females from the North Carolina coast. As the specific epithet

implies, the integument is densely setose. In dorsal view the pleotelsonic apex is entire, differing from the notched female pleotelson of *P. glynni*, and very different from the notched and strongly sculptured female pleotelson of *P. cohenae*.

Paracerceis nuttingi (Boone, 1921), was described from Barbados and since recorded from Puerto Rico (Menzies and Glynn, 1968:55, 113). Boone's material consisted only of females. Menzies and Glynn record an immature male with an incipient pleotelsonic notch. Although the pleotelsonic notch of *P. nuttingi* resembles that of *P. cohenae*, Boone's species has a nonsculptured pereon and pleon, whereas *P. cohenae* is strongly tuberculate. The notch in the female of *P. glynni* is much deeper than in *P. nuttingi*, whereas the latter species can also be separated by the length of the lobes of the maxillipedal palp segments. In *P. glynni*, these lobes are very much shorter.

Paracerceis edithae Boone, 1930, was described from Haiti and has since been redescribed on material from Puerto Rico and Haiti (Glynn, 1972). This distinctive species has been collected in Belize in depths of 11–23 m, taken on four occasions only in association with sponges. Glynn's statement (1972:146) concerning *P. edithae* replacing *P. caudata* can thus be qualified. The male pleotelsonic apex of *P. edithae*, with its strong median tooth and broad lateral lobes, immediately separates it from the shallower dentate notch of *P. cohenae* and the very deep notch of *P. glynni*. The pleotelsonic apex of the female *P. edithae*, shown as almost entire, or faintly trilobed in the Belize specimens, again differs from the broadly notched condition in *P. cohenae* and the much deeper notch of *P. glynni*.

Paracerceis caudata (Say), the most widespread *Paracerceis* species in the Caribbean, with its bowed uropodal exopod and dentate pleotelsonic notch in the male, and truncate pleotelsonic apex in the female, is easily separated from the two species described herein.

ETYMOLOGY.—The species is named for Dr. Peter W. Glynn, in recognition for his many valuable contributions to isopod systematics.

Family CIROLANIDAE

Genus *Metacirolana* Nierstrasz, 1931

Metacirolana agaricicola, new species

FIGURES 21, 22

MATERIAL EXAMINED.—*Holotype*: USNM 211259, ♂, TL 2.6 mm, sta H(81)-32, from *Porites* sp. coral on spur and groove, outer reef slope, 9.1 m.

Paratypes: USNM 211260, 2 ovig ♀, TL 2.0–2.1 mm, 2 ♀, TL 2.0 mm, sta K-35, rubble and coarse sediment on outer reef slope, 20 m. USNM 211261, ♂, TL 2.0 mm, 1 ovig ♀, TL 2.0 mm, 5 ♀, TL 1.8–2.1 mm, 2 juvs, sta H(81)-17, on *Agaricia* sp. coral on fore reef, 15.2 m.

Additional Material: USNM 211262, ♂, 7 ♀, sta H(81)-13, H(81)-15, H(81)-16, H(81)-42, on *Agaricia* sp. coral on fore reef, 1–15.2 m.

DESCRIPTION.—*Male*: Integument dorsally with scattered red-brown chromatophores on head, pleotelson, and uropods. Pereonites and pleonites with relatively dense transverse broken bands of chromatophores. Body dorsally arched, slightly more than twice longer than wide, widest at pereonite 6. Head with large dorsolateral eyes; fairly strong rostral point; frontal lamina anteriorly convex, tapering to point between bases of antenna 2; clypeus broadly triangular, projecting ventrally. Coxal plates becoming more acutely produced posterodistally. Pereonite 1 slightly longer middorsally than remaining subequal pereonites. Epimeron of pleonite 1 shorter than that of pleonite 2, overlapped by coxal plate of pereonite 7. Hind margin of pleonite 5 broadly trilobed; faint submedian furrows demarking lobes. Telson wider than long, basally broad, straight lateral margins tapering to broadly triangular posterior margin, latter dentate, with fine plumose setae alternating with teeth.

Antenna 1, basal peduncle segment broader with slightly shorter than segment 2; segment 3 narrower and 1/3 length of segment 2; flagellum of 7 articles, 2 basal articles with cluster of about

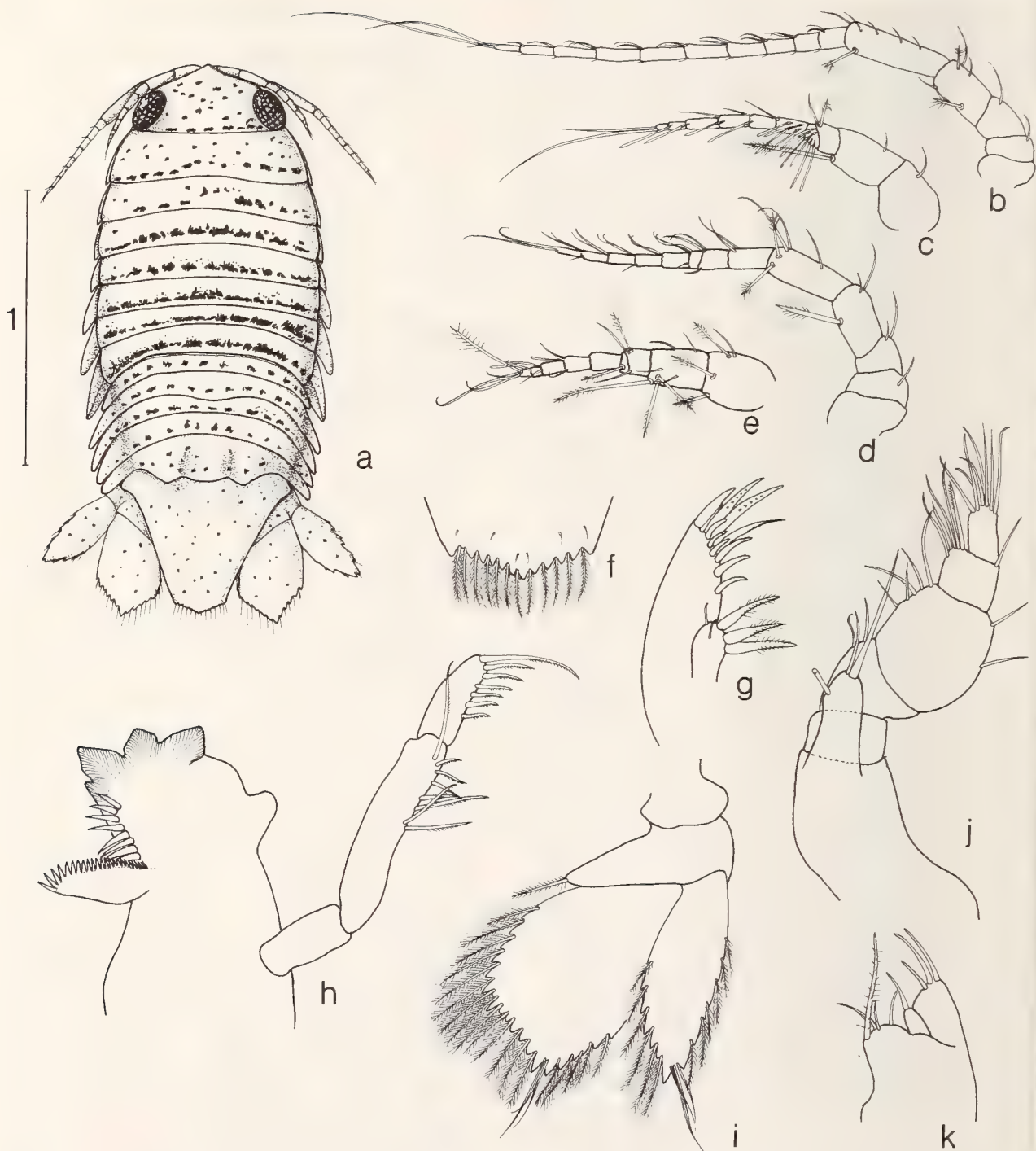


FIGURE 21.—*Metacirolana agaricicola*, new species: *a*, ♀, dorsal view; *b*, antenna 2, ♂; *c*, antenna 1, ♂; *d*, antenna 2, ♀; *e*, antenna 1, ♀; *f*, pleotelsonic apex; *g*, maxilla 1; *h*, mandible; *i*, uropod; *j*, maxilliped; *k*, maxilla 2.

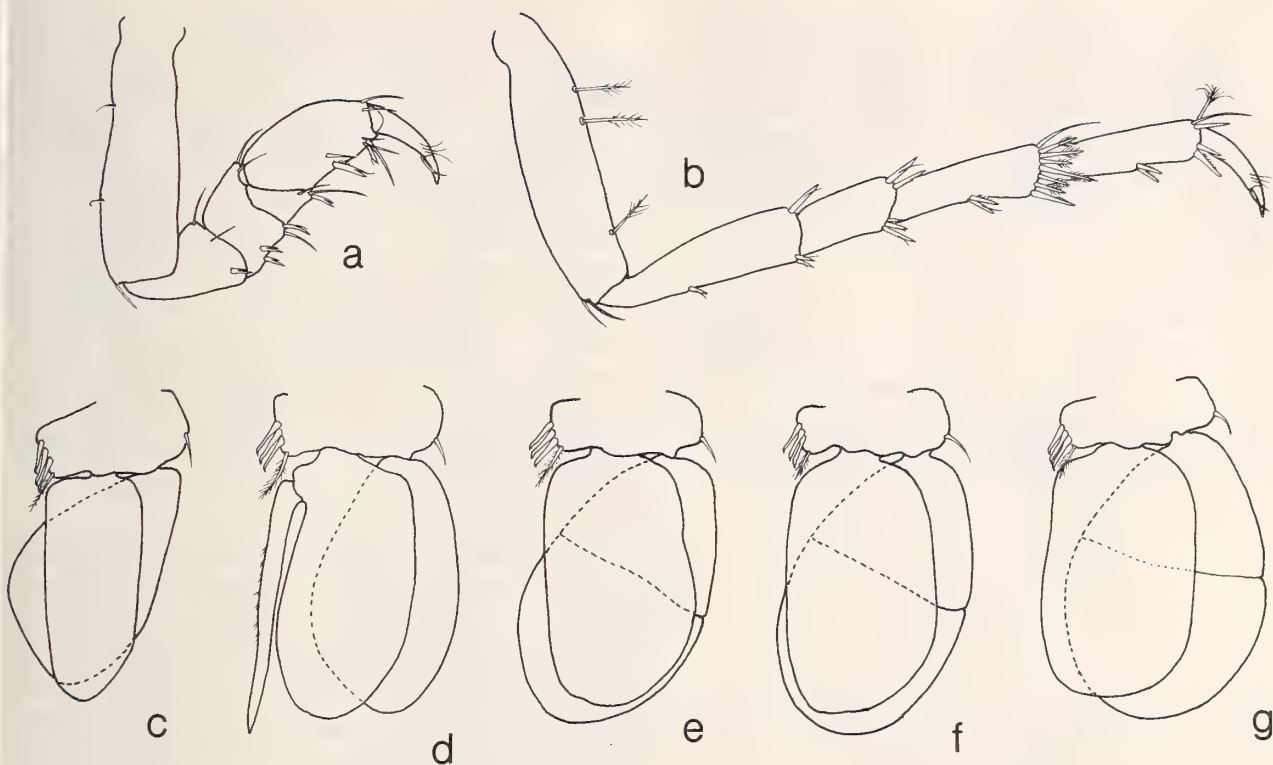


FIGURE 22.—*Metacirolana agaricicola*, new species: a, pereopod 1; b, pereopod 7; c, pleopod 1; d, pleopod 2; e, pleopod 3; f, pleopod 4; g, pleopod 5.

10 aesthetascs, remaining articles each with single aesthetasc. Antenna 2 reaching posteriorly to pereonite 4; 5 peduncle segments becoming progressively longer distally; flagellum of 10 articles, terminal article with 2 elongate setae. Mandibular palp, segments 1 and 3 subequal in length, each half length of segment 2; latter with 8 distal fringed spines; segment 3 with 7 distal fringed spines; incisor of 3 large and 1 small sclerotized cusps; spine row with 8 spines. Maxilla 1, inner ramus with 3 stout fringed setae; outer ramus with 11 distal spines. Maxilla 2, inner ramus with 4 mediobasal spines, innermost longest and fringed; inner lobe of outer ramus reduced, with 1 terminal spine; outer lobe with 3 terminal spines. Maxillipedal endite reaching midlength of palp segment 2, with 2 distal setae, and coupling hook on medial margin; palp segment 3 broadest and longest. Pereopod 1 short; propodus somewhat expanded, with 2 clusters of spines

on posterior margin; carpus triangular, with single posterodistal spine cluster; merus with 2 spine clusters on posterior margin. Pereopods becoming more elongate posteriorly; pereopod 7, propodus subequal in length to carpus, with 2 pairs of spines on posterior margin; carpus with 2 spines on posterior margin, distal margin bearing several fringed spines. Pleopod 1, basis with 3 retinacula; endopod parallel-sided, distally broadly rounded; exopod distally expanded, distal margin oblique-truncate. Pleopod 2, endopod elongate-oval, with copulatory stylet articulating at base, just reaching beyond ramus; exopod broadly oval. Pleopods 3–5 with endopods oval-rectangular, exopods broadly oval, with transverse suture at about midlength. Uropodal protopod produced into triangular lobe, not reaching midlength of endopod; latter distally expanded, distal margin strongly dentate, angled, with plumose setae between marginal teeth; exopod nar-

rowly oval, distally acute, margins strongly dentate, with plumose setae between marginal teeth.

Female: Body form as in male. Eyes slightly smaller than in male. Antenna 1, flagellum of 6 articles, articles 3–5 each with single aesthetasc. Antenna 2 reaching posteriorly to pereonite 3; flagellum of 8 articles.

REMARKS.—See “Remarks” section at end of *Metacirrolana menziesi*.

ETYMOLOGY.—The specific epithet is derived from the coral genus *Agaricia* plus the Latin suffix *-cola* (to dwell) and alludes to the fact that almost all the specimens were taken from this coral living on the Carrie Bow Cay reef.

Metacirrolana halia, new species

FIGURES 23, 24

MATERIAL EXAMINED.—*Holotype:* USNM 211263, ♂, TL 2.9 mm, sta RC-30, reef crest rubble, 0.1 m.

Allotype: USNM 211264, ovig ♀, TL 2.7 mm, sta RC-30, reef crest rubble, 0.1 m.

Paratypes: USNM 211265, 5 ♂, TL 2.8–2.9 mm, 3 ovig ♀, TL 2.1–2.5 mm, 23 ♀, TL 2.1–2.6 mm, 9 juvs, sta RC-22, reef crest rubble, 0.1 m. USNM 211266, 4 ♂, TL 2.4–2.9 mm, 3 ovig ♀, TL 2.5–2.7 mm, 19 ♀, TL 2.4–2.8 mm, 12 juvs, sta RC-30, reef crest rubble, 0.1 m.

Additional Material: USNM 211267, ~100 specimens, sta CBC-2.5.74-2, CBC-2.5.74-3, CBC-4.5.74-3, CBC-7.5.74-1, from rubble on fore reef slope, 0.5 m. USNM 211268, ~180 specimens, sta K-3, K-6, K-35, K-36, K-55, K-56, K-62, K-65, K-98, K-105, K-106, K-107, K-132, K-134, K-135, K-137, K-139, K-145, from reef crest rubble, on algal clumps (*Caulerpa racemosa*, *C. verticillata*, *Halimeda* sp.), coarse sediment and rubble, fore reef, 0–23 m. USNM 211269, ~100 specimens, sta H(81)-8, H(81)-9, H(81)-11, H(81)-12, H(81)-13, H(81)-15, H(81)-17, H(81)-19, H(81)-20, H(81)-27, H(81)-28, H(81)-29, H(81)-30, H(81)-32, H(81)-33, H(81)-34, H(81)-35, H(81)-36, H(81)-37, H(81)-38, H(81)-39, H(81)-40, H(81)-41, H(81)-42, H(81)-48, H(81)-53, H(81)-54, H(81)-55, H(81)-57, from *Agaricia*

sp., *Madracis* sp., and *Porites* sp. corals, algal clumps (*Halimeda* sp.), from reef crest to spur and groove zone on fore reef, 0–15.2 m. USNM 211272, 2 specimens, sta H(80)-1, H(80)-10, Glover's Reef, Belize, 12–21 m. USNM 211273, ~600 specimens, sta RC-6, RC-7, RC-11, RC-12, RC-13, RC-15, RC-16, RC-17, RC-18, RC-19, RC-20, RC-21, RC-23, RC-24, RC-25, RC-26, RC-27, RC-28, RC-29, RC-41, RC-42, RC-43, RC-44, RC-45, RC-46, RC-47, RC-48, RC-49, RC-50, RC-52, RC-55, RC-58, RC-59, RC-60, RC-71, RC-96, RC-97, RC-101, RC-102, RC-103, RC-104, RC-106, RC-107, RC-108, RC-109, RC-110, RC-111, RC-117, reef crest rubble, 0.1 m.

DESCRIPTION.—*Male:* Integument dorsally with sparsely scattered chromatophores. Body dorsally arched, about 3 times longer than wide, widest at pleonite 5. Head with large dorsolateral eyes; tiny rostral point present; frontal lamina anteriorly rounded, tapering sharply posteriorly; clypeus broadly triangular, projecting ventrally. Pereonite 1 longer than remaining subequal pereonites. Coxal plates: pereonite 1 anteroventrally rounded, posteroventrally acute, pereonites 2–6 becoming posteroventrally produced and acute, pereonite 7 coxal plate slightly shorter than that of pereonite 6 in lateral view. Pleonites 1–5 free, subequal in middorsal length, occasionally with tiny denticles on hind margins. Telson tapering to truncate posterior margin armed with 8 stout spines and intervening plumose setae.

Antenna 1 reaching posteriorly to pereonite 5; 2 basal peduncle segment broad, segment 2 longer than segment 1; segment 3 about $\frac{1}{3}$ length and much narrower than segment 2; flagellum of 14 articles, 2 basal articles bearing 4 rows of aesthetascs. Antenna 2 reaching posteriorly to pereonite 7, 3 basal peduncle segments subequal in length, segment 4 $\frac{1}{3}$ longer than segment 3; segment 5 about twice length of 4, narrower; flagellum of 11 articles, terminal article with 2 elongate setae. Mandibular palp 3-segmented, segment 2 about twice length of segment 1, bearing 12 fringed spines distally; segment 3 about half length of segment 2, with 9 spines increasing in length distally; incisor with 3

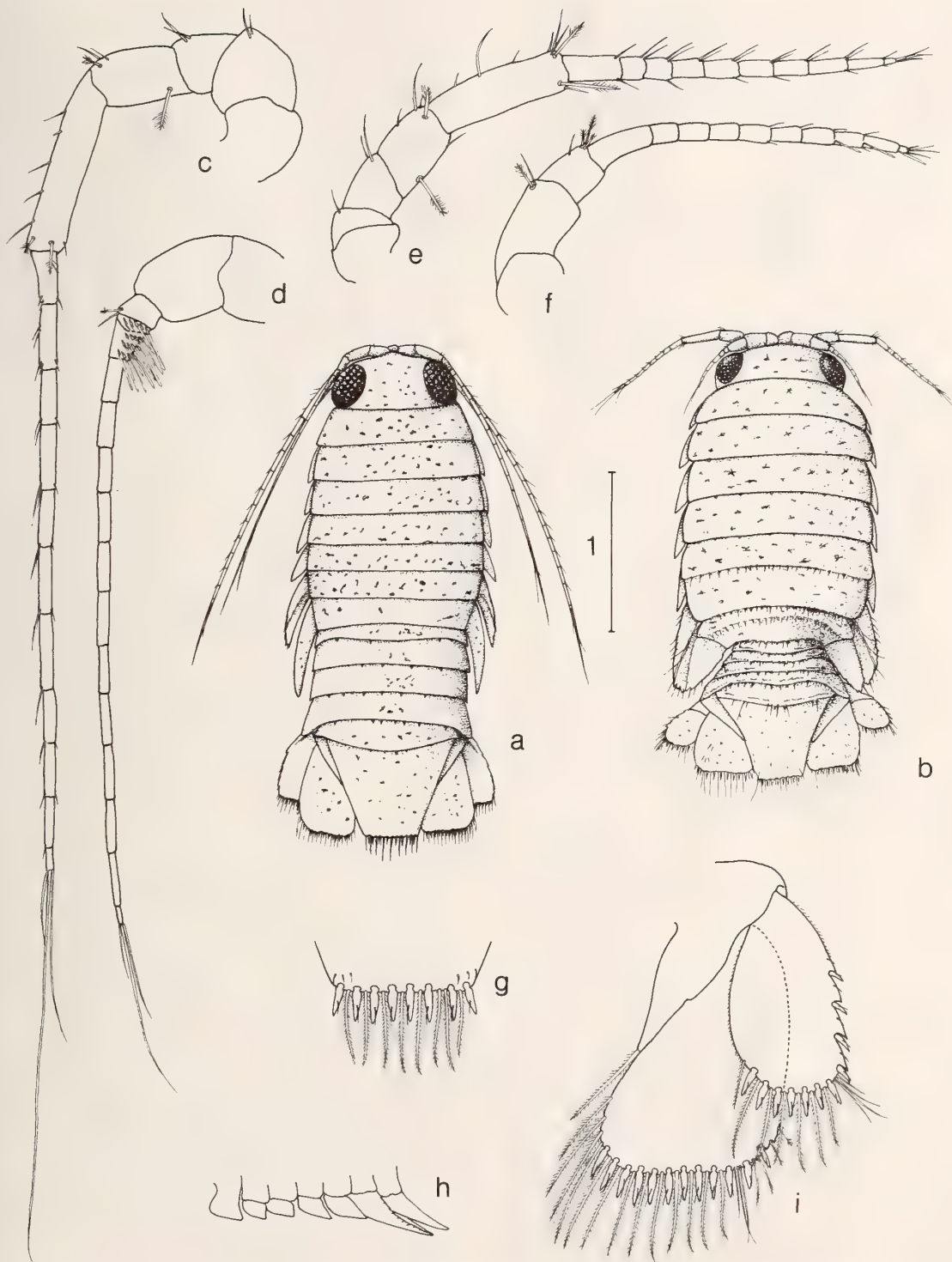


FIGURE 23.—*Metacirolana halia*, new species: *a*, ♂, dorsal view; *b*, ♀, dorsal view; *c*, antenna 2, ♂; *d*, antenna 1, ♂; *e*, antenna 2, ♀; *f*, antenna 1, ♀; *g*, pleotelsonic apex; *h*, coxal plates, lateral view; *i*, uropod.

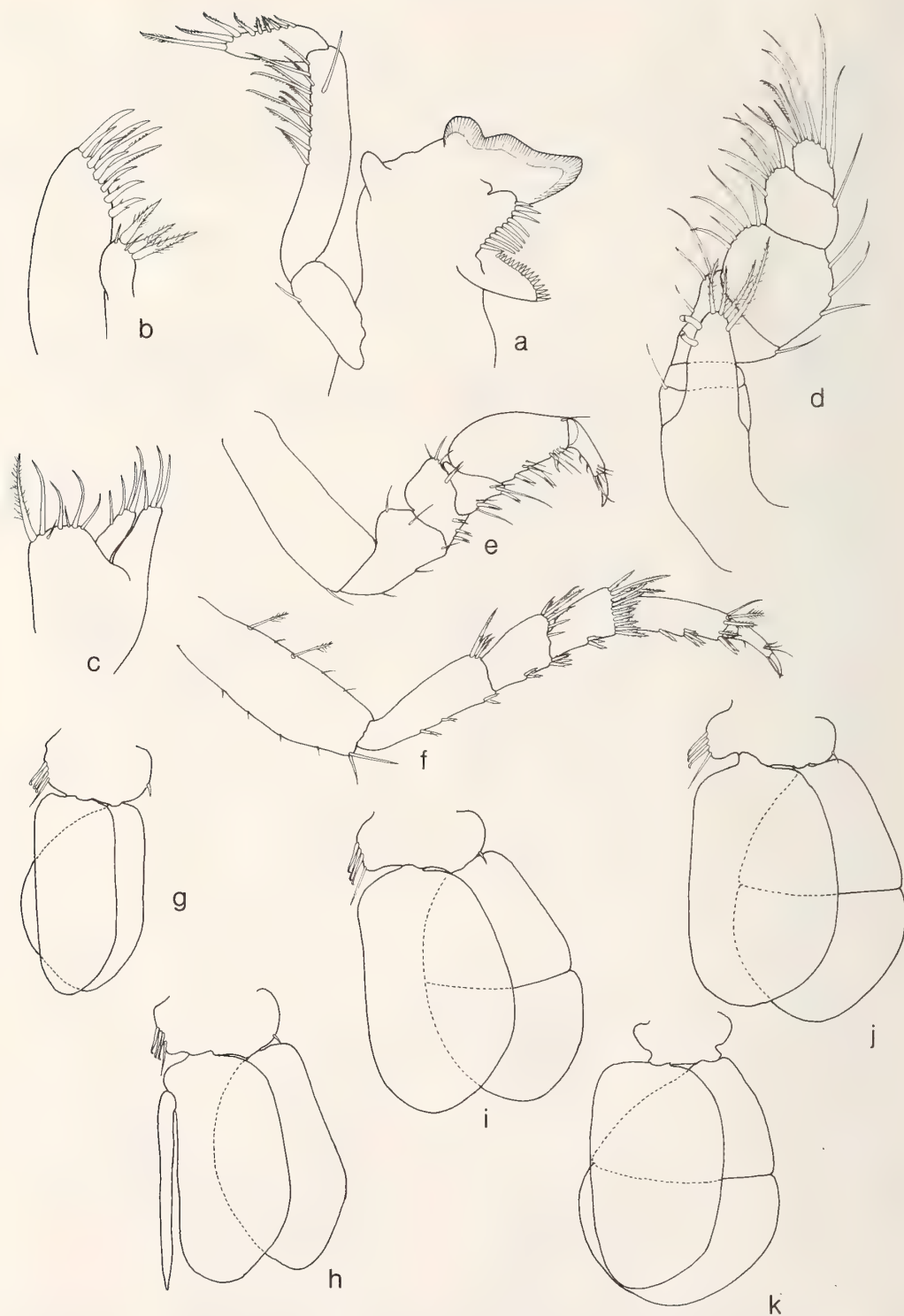


FIGURE 24.—*Metacirolana halia*, new species: *a*, mandible; *b*, maxilla 1; *c*, maxilla 2; *d*, maxilliped; *e*, pereopod 1; *f*, pereopod 7; *g*, pleopod 1; *h*, pleopod 2, ♂; *i*, pleopod 3; *j*, pleopod 4; *k*, pleopod 5.

strongly sclerotized cusps; spine row with 9 spines. Maxilla 1, inner ramus with 3 stout setae; outer ramus with 10 distal spines. Maxilla 2, inner ramus with 5 elongate spines on broad distal margin, innermost spine longest, fringed; inner lobe of outer ramus with 4 spines, outer lobe with 3 spines. Maxillipedal endite with 2 coupling hooks on median margin, and 4 fringed setae palp with segment 3 longest and broadest, 3 distal segments setose on mediodistal margin. Pereopod 1, dactylus with strong unguis; propodus proximally expanded, posterior margin with 3 sensory spines; carpus triangular, with 2 sensory spines on posterior margin; merus with 3 short sensory spines on posterior margin. Pereopod 7, propodus with 4 distal fringed spines, posterior margin with 2 clumps of spines; carpus with distal band of about 11–12 fringed spines, 2 spine clumps on posterior margin; merus with anterodistal clump of fringed spines, 2 spine clumps on posterior margin; ischium with 3 anterodistal fringed spines, 3 spines on posterior margin. Pleopod 1, endopod narrower than exopod, parallel-sided for $\frac{2}{3}$ of length, distally broadly rounded; exopod ovate, distally broad. Pleopod 2, endopod and exopod equally broad copulatory stylet articulating near base of endopod, cylindrical, apically tapered, just reaching beyond ramus. Pleopods 3–5, endopods broadly ovate, with transverse suture at about midlength. Uropodal basis produced into acutely triangular lobe along medial margin of endopod; endopod distally expanded, bearing 12 stout spines and plumose setae; exopod ovate, outer margin serrate, bearing 11 stout spines on outer and distal margins, plus plumose setae.

Female: Body markedly setose in posterior half, about twice longer than wide. Dorsolateral eyes not so large as in male. Pleon shorter than in male, more setose, with tiny scattered denticles on posterior margins. Antenna 1 reaching posteriorly to pereonite 1, flagellum of 10 articles, single aesthetasc on articles 7–9. Antenna 2 reaching posteriorly to pereonite 2, flagellum of 10 articles.

REMARKS.—See “Remarks” section at end of *Metacirolana menziesi*.

ETYMOLOGY.—The specific epithet is derived from the Greek *halis* (abundance, crowds, swarms) and refers to the fact that the species occurs in large numbers in a variety of habitats at Carrie Bow Cay.

Metacirolana menziesi, new species

FIGURES 25, 26

MATERIAL EXAMINED.—*Holotype:* USNM 211251, ♂, TL 2.3 mm, sta K-74, rubble from outer reef slope, 18 m.

Allotype: USNM 211252, ovig ♀, TL 2.1 mm, sta K-62, rubble from outer reef slope, 5–8 m.

Paratypes: USNM 211253, ♂, TL 2.2 mm, 5 ovig ♀, 2.0–2.4 mm, 2 ♀, sta AC-509, rubble from spur and groove zone, 14 m. USNM 211254, 2 ♂, TL 2.0 mm, 5 ♀, TL 2.0–2.2 mm, 1 juv, sta K-62, rubble from outer reef slope, 5–8 m.

Additional Material: USNM 211255, 1 ♂, 6 ovig ♀, 13 ♀, 2 juvs, sta K-4, K-65, K-70, K-73, K-74, from rubble on fore reef slope; from clumps of *Halimeda* sp. on fore reef, 0.5–30 m. USNM 211256, 8 ♀, 12 juvs, sta H(80)-11, H(80)-16, H(80)-22, H(80)-32, H(80)-41, rubble from fore reef, 27–36 m. USNM 211257, ♀, sta H(83)-1, reef drop-off, 128 m. USNM 211258, 6 ♀, 2 juvs, sta RC-20, reef crest rubble, 0.1 m.

DESCRIPTION.—*Male:* Body dorsally strongly arched, $2\frac{1}{2}$ times longer than wide, widest at pereonite 6. Integument with scattered red-brown chromatophores on head, pereon, and pleon. Under very high magnification, integument of head and pereon with very fine transverse striae: Head with large dorsolateral eyes; fairly strong rostral point; frontal lamina anteriorly convex, tapering to point between bases of antenna 2. Clypeus broadly triangular, projecting ventrally. Coxal plates 1–4 with posteroventral corners more or less right angled; 5–7 produced posteriorly, acute. Pereonite 1 about twice length of pereonite 2; pereonites 2–7 subequal in middorsal length. Sideplate of pleonite 1 overlapped by coxal plate of pereonite 7; sideplate of pleonite 5 overlapped by that of pleonite

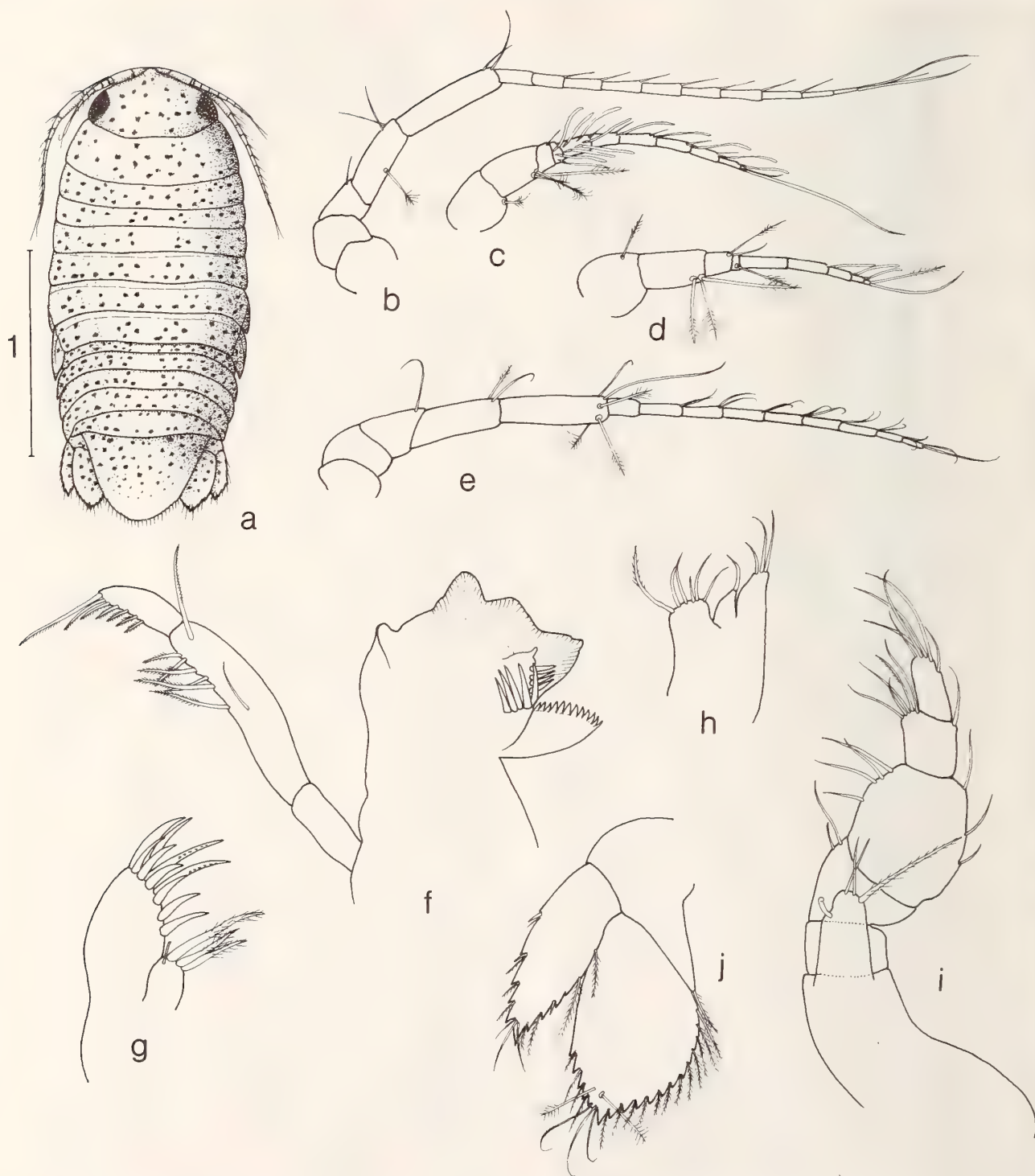


FIGURE 25.—*Metacirolana menziesi*, new species: *a*, ♀, dorsal view; *b*, antenna 2, ♂; *c*, antenna 1, ♂; *d*, antenna 1, ♀; *e*, antenna 2, ♀; *f*, mandible; *g*, maxilla 1; *h*, maxilla 2; *i*, maxilliped; *j*, uropod.

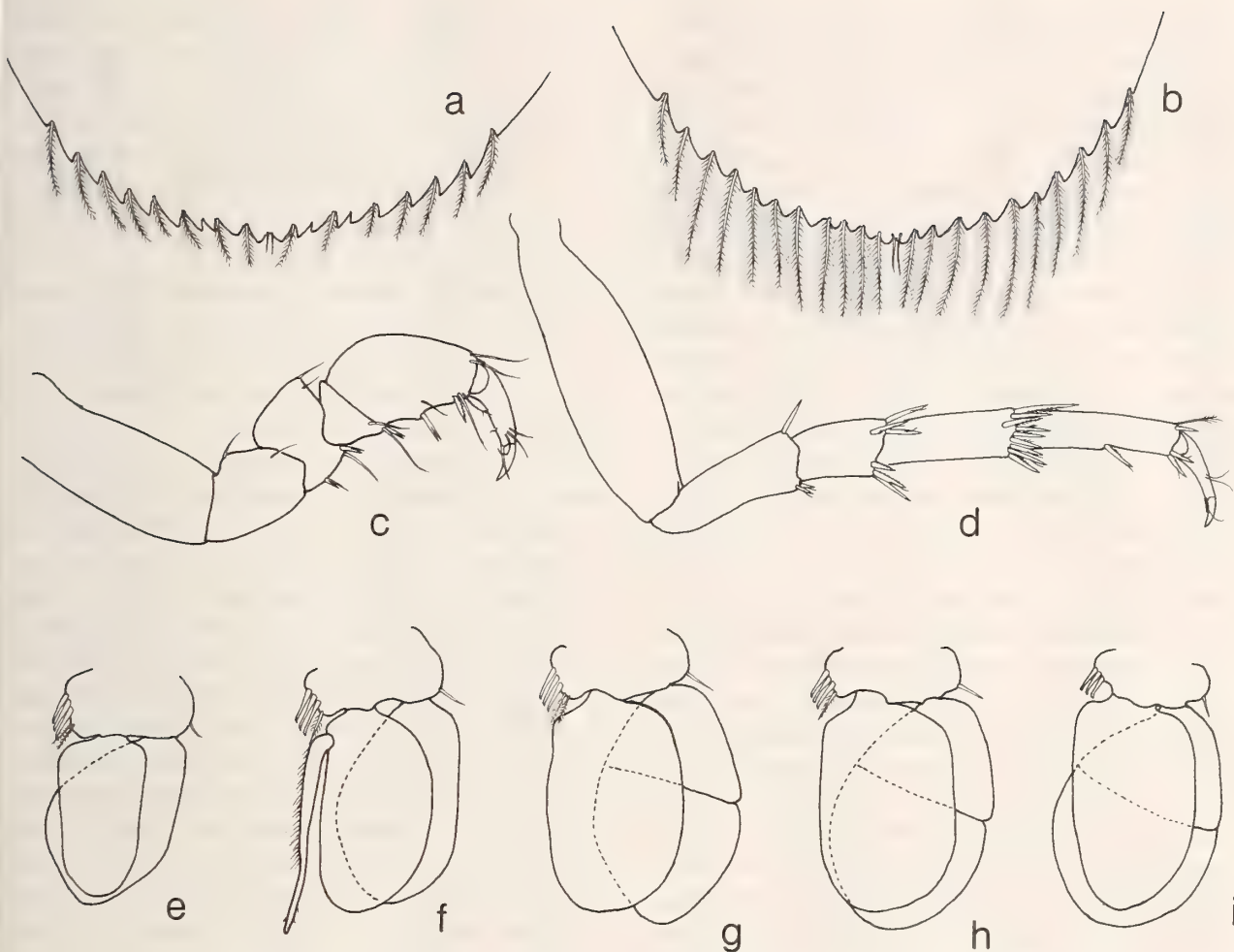


FIGURE 26.—*Metacirolana menziesi*, new species: a, pleotelsonic apex, ♂; b, pleotelsonic apex, ♀; c, pereopod 1; d, pereopod 7; e, pleopod 1; f, pleopod 2, ♂; g, pleopod 3; h, pleopod 4; i, pleopod 5.

4; posterior margin of pleonite 5 faintly sinuous. Pleotelson considerably broader than long, posterior margin evenly convex, with about 20 fine teeth interspersed with short plumose setae.

Antenna 1, 2 basal peduncle segments subequal; segment 3 short; flagellum of 8 articles, articles 1 and 2 with several aesthetascs, articles 3–7 each with single aesthetasc. Antenna 2 reaching posteriorly to pereonite 3; peduncle segments 1–3 short, subequal in length; segments 4 and 5 cylindrical; segment 4 about $\frac{2}{3}$ length of segment 5; flagellum of 10 setose articles. Mandibular palp 3-segmented, segment 2 with 7 fringed spines distally; segment 3 $\frac{2}{3}$ length of segment

2, with 7 distal fringed spines; incisor of 3 broad cusps, spine row with 9 stout spines. Maxilla 1, inner ramus with 3 stout fringed setae; outer ramus with 10 distal spines, some faintly dentate. Maxilla 2, inner ramus with 6 mediodistal spines; inner lobe of outer ramus with single terminal spine, outer lobe with 3 spines. Maxillipedal endite with single coupling hook, 1 fringed and 2 simple distal setae; palp segment 3 broadest and longest. Pereopod 1 shorter than following legs; propodus somewhat expanded, with 1 serrate and 1 sensory spine on posterior margin; carpus short, triangular, with 1 posterodistal sensory spine; merus with 2 sensory spines on posterior

margin. Pereopod 7, propodus with 2 postero-distal spines, and 1 spine at midlength of posterior margin; carpus rectangular, with cluster of distal fringed spines; merus and ischium each with several distal spines. Pleopod 1, basis with 3 retinaculæ; endopod shorter and narrower than exopod; latter distally expanded. Pleopod 2, copulatory stylet articulating at base of endopod, extending beyond ramus. Pleopods 3–5 with endopod subsimilar, exopods becoming broader posteriorly, each with transverse suture. Uropodal basis with narrowly triangular lobe produced along medial margin of inner ramus; latter with broadly rounded mediodistal serrate margin, outer margin less convex; outer ramus half width of endopod, tapering, apically acute, margins distally serrate.

Female: Very similar to male, with eyes slightly smaller. Antenna 1, flagellum of 6 articles, 3 distal articles each with single aesthetasc. Antenna 2, flagellum of 9 articles. Posterior pleotelsonic margin with 22–24 serrations and intervening plumose setae relatively longer than in male.

REMARKS.—The genus *Metacirolana*, as diagnosed by Bruce (1981), possesses an anteriorly dilated frontal lamina, a triangular projecting clypeus, a maxillipedal endite with one coupling hook, and a 5-segmented pleon, with pleonite 5 not overlapped by pleonite 4.

The three species of *Metacirolana* described above agree with the diagnosis in the frontal lamina and clypeus structure. *Metacirolana halia*, however, possesses two coupling hooks on the maxillipedal endite, and pleonite 5 is overlapped by pleonite 4. *Metacirolana agaricicola* agrees in all points of the diagnosis. In *M. menziesi* pleonite 4 overlaps pleonite 5. In spite of the shortcoming of the generic diagnosis, these three species do seem to form a natural group, all possessing a very similar frontal lamina and projecting clypeus, perhaps the most important features of the genus.

Metacirolana halia bears a striking resemblance to *M. spinosa* Bruce, 1980, described from Queensland, Australia, especially in the tail-fan

structure. Bruce's species, however, is more strongly spinose on the posterior margins of pereonite 7 and pleonites 1–5, whereas the coxal plates of pereonites 6 and 7 are broader, that of pereonite 7 markedly shorter than 6 in *M. spinosa*. In *M. halia*, coxal plate 7 is only slightly shorter than 6 and narrower and more acute than in the Australian species.

Metacirolana menziesi superficially bears some resemblance to *M. serrata* (Bruce, 1980) from Heron Island, Great Barrier Reef, Australia. The general body shape and tail-fan structure are very similar, but differences may be seen in the spination of maxilla 2, the mandibular palp segments, and the posterior pereopods. The flagella of antenna 1 and 2 in the Australian species possess more articles than the present species, whereas the posterior margin of pleonite 5 is trilobed in *M. serrata*, evenly convex in *M. menziesi*. Bruce (1981) correctly points out the error of identification of *Cirolana mayana* by Menzies and Glynn (1968). In fact, their figure of *Cirolana mayana* agrees well with *Metacirolana menziesi*, but as their Puerto Rico material could not be located, this identification could not be confirmed.

The three species of *Metacirolana* that occur at Carrie Bow Cay may easily be separated by the morphological features given in the following tabulation.

| | <i>M. agaricicola</i> | <i>M. halia</i> | <i>M. menziesi</i> |
|-------------------------------|-----------------------|----------------------|----------------------|
| Posterior pleotelsonic margin | triangular, dentate | truncate, spinose | convex, dentate |
| Antenna 2 ♂ | reaching pereonite 4 | reaching pereonite 7 | reaching pereonite 3 |
| Uropodal endopod | distally angular | distally truncate | distally angular |
| Uropodal exopod | distally acute | distally rounded | distally acute |
| Pleonite 5, posterior margin | trilobed | convex | faintly convex |

ETYMOLOGY.—This species is named for the

late Dr. Robert J. Menzies, indefatigable isopod worker.

Suborder GNATHIIDEA

Family GNATHIIDAE

Genus *Gnathia* Leach, 1813

Gnathia rathi, new species

FIGURE 27

MATERIAL EXAMINED.—*Holotype*: USNM 211328, ♂, TL 1.6 mm, sta H(80)-11, from fore reef slope, 27.4 m.

Paratypes: USNM 211329, 13 ♂, TL 1.6–1.9 mm, 3 ♀, 1.8–2.2 mm, sta H(83)-1, brought up by fishing line, off reef drop-off, 128 m. USNM 211330, 14 ♂, TL 1.6–1.9 mm, 2 ♀, TL 1.6–1.8 mm, sta H(80)-22, fore reef slope, 36 m.

Additional Material: USNM 211331, 18 ♂, 1 ovig ♀, 1 ♀, 2 praniza, sta H(80)-4, H(80)-11, H(80)-18, fore reef slope, 1–27.2 m. USNM 211332, 2 ♂, sta K-101, rubble from fore reef slope, 25 m. USNM 211333, 3 ♂, sta CBC.2.5.74-2, CBC.4.5.74-3, rubble from reef flat, 0.5–1.0 m.

DESCRIPTION.—*Male*: Integument of head and pereonites 1–3 indurate, finely granular. Head with anterior margin barely convex, with lateral conical tubercle medial to mandible; anterolateral corner bluntly triangular; anteromedial part of head hollowed, posteromedial part convex; lateral eyes well pigmented. Pereonite 1 short, lacking free lateral margins. Pereonite 2 slightly shorter than pereonite 3. Pereonites 4–6 broad, poorly defined; pereonite 7 very short, hidden beneath posterior margin of pereonite 6. Pleonites subequal in length. Telson triangular, slightly longer than basal width, lateral margins proximally shallowly serrate, sinuous.

Antenna 1, peduncle segment 3 equal in length to 2 basal segments together; flagellum of 4 articles, penultimate article with 1 aesthetasc, terminal article with 2 aesthetascs. Antenna 2, 3

basal peduncle segments short, segment 4 $\frac{2}{3}$ length of segment 5; flagellum of 6 articles. Mandible with subacute apex, cutting edge barely crenulate, outer margin with strong convex ridge. Maxilliped of 5 segments, basal segment broad, semicircular, with triangular lobe at inner distal corner; 4 distal segments bearing finely fringed setae. Pylopod with broad basal segment bearing finely fringed setae on convex medial margin; distal ovate segment very small, margins setulose. Pereopod 1, dactylus with strong unguis and tiny accessory spine; propodus with 2 spines on posterior margin; carpus with 2 conical tubercles on posterior margin; merus and ischium with scattered tubercles on posterior surface. Pereopod 6 with posterior margins of propodus, carpus, merus, and ischium with fringed scales; basis with spinose tubercles on anterior surface. Uropodal exopod narrower than but subequal in length to endopod; both rami bearing elongate seta.

Female: Typical of genus.

REMARKS.—Three species of *Gnathia* have been recorded from the Caribbean. The commonest, *G. puertoricensis* Menzies and Glynn, was collected along with *G. rathi* at several stations at Carrie Bow Cay. The earlier species has a tiny rostral point flanked by a subacute tubercle, giving the frontal margin a tridentate appearance. The outer ridge of the mandible is not so robust as in *G. rathi*, and the cutting margin is more strongly dentate. The strongly granulate anterior integument of *G. rathi* is not seen in the earlier species.

Gnathia beethoveni Paul and Menzies, from Venezuela, has a median notch and two lateral tubercles on the frontal margin of the head, a mandible with a dentate cutting edge, and lacks integumental granulations.

Gnathia triospathiona Boone, from the Gulf Stream off Florida, is a much larger species (♂ TL 8.8 mm) than *G. rathi*, lacks integumental granulations, and has a produced frontal margin.

ETYMOLOGY.—The species is named for Tony Rath, as a small token of appreciation for his assistance as station manager at Carrie Bow Cay.

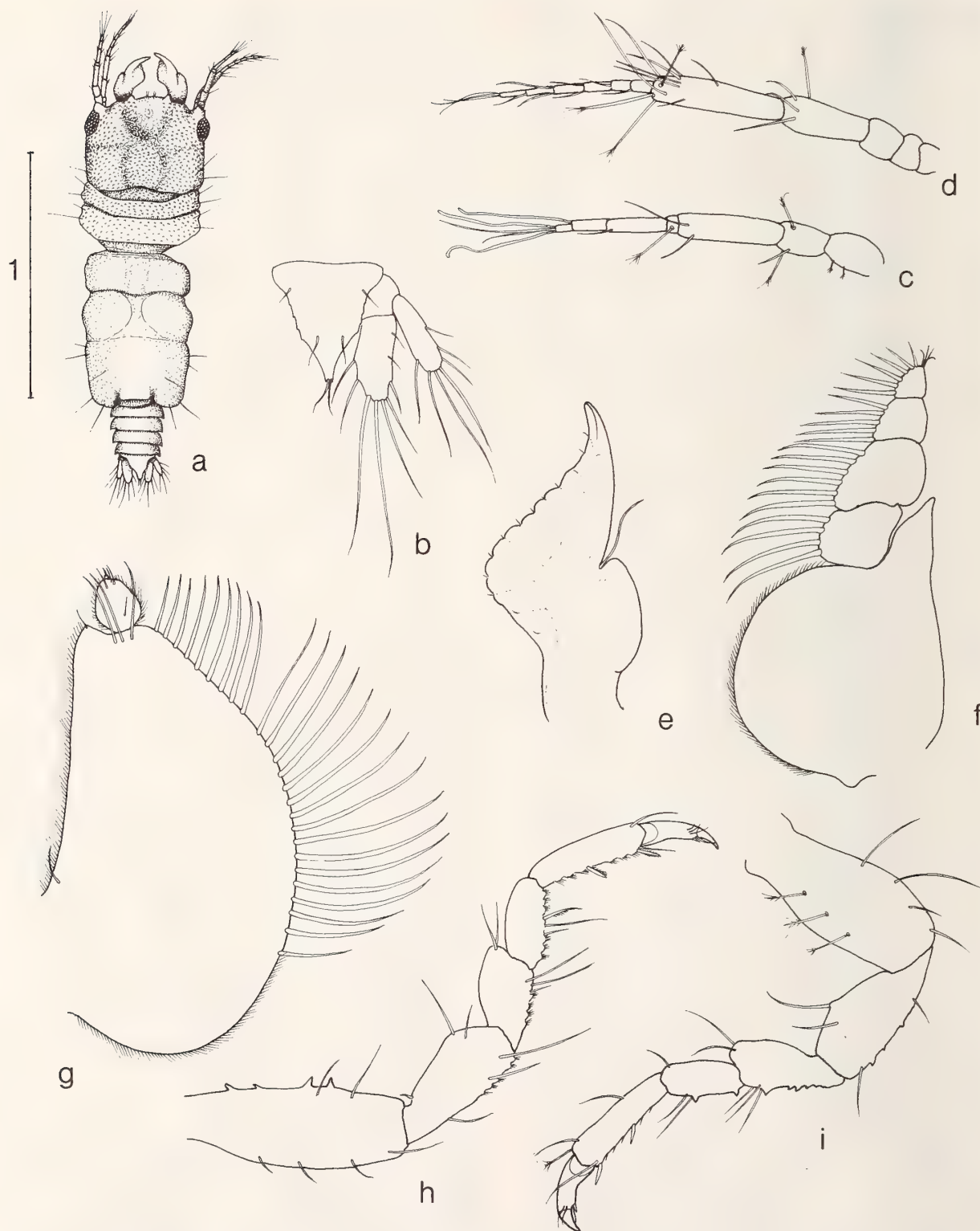


FIGURE 27.—*Gnathia rathi*, new species: *a*, ♂, dorsal view; *b*, pleotelson and uropod; *c*, antenna 1; *d*, antenna 2; *e*, mandible; *f*, maxilliped; *g*, pylopod; *h*, pereopod 6; *i*, pereopod 1.

Suborder VALVIFERA

Family ARCTURIDAE

Genus *Astacilla* Cordiner, 1793*Astacilla regina*, new species

FIGURES 28, 29

MATERIAL EXAMINED.—*Holotype*: USNM 211334, ♂, TL 6.5 mm, sta H(80)-22, fore reef slope, 36 m.

Allotype: USNM 211335, ovig ♀, TL 7.1 mm, sta H(80)-41, fore reef slope, 36 m.

Paratypes: USNM 211336, 2 ♂, TL 5.9–6.5 mm, 9 juvs, TL 3.1–4.6 mm, sta H(80)-4, H(80)-11, H(80)-22, fore reef slope, 27.4–36 m.

DESCRIPTION.—*Male*: Body elongate-cylindrical, geniculate between pereonites 4 and 5. Integument tuberculate. Head with anterior margin evenly concave; anterolateral lobes well produced, rounded in lateral view, with small conical tubercle anterodorsally; dorsolateral eyes large, well pigmented, subcircular; pair of submedian conical tubercles above eye, second large posterior pair; ventral margin of head not concealing mouthparts. Pereonite 1 fused with head, line of fusion marked by slit in ventral margin; middorsal tubercle near posterior margin; large lateral tubercle present. Pereonites 2 and 3 subequal, each with small middorsal tubercle, several smaller lateral tubercles. Pereonite 4, 8 times longer than wide, cylindrical, with strong conical middorsal tubercle just anterior to midlength, smaller middorsal tubercle near posterior margin; several small scattered tubercles. Pereonites 5–7 decreasing in length posteriorly, each with middorsal conical tubercle. Pleotelson with 2 anterior fused pleonites very weakly indicated, with anterior middorsal tubercle, well-marked lateral “shoulder”; apex subacute.

Antenna 1, basal peduncle segment with distodorsal conical tubercle, about twice width and 1.5 times length of segment 2; segment 3 slightly narrower and longer than segment 2; flagellum of single article, subequal in length to peduncle, with row of 10 ventral aesthetascs. Antenna 2, 2

basal peduncle segments relatively short, segment 2 with 2 distal tubercles; segments 3–5 elongate-cylindrical, segment 4 almost twice length of segment 3; segment 5 subequal to segment 4; flagellum of 2 articles. Mandible with tricuspid incisor, dentate lacinia mobilis; 2 spines in spine row; broadly truncate molar with strong marginal teeth. Maxilla 1, inner ramus with 3 distal fringed setae; outer ramus with 10 stout distal spines, some with dentate margins. Maxilla 2, inner ramus with 6 fringed setae on medio-distal margin, several slender setae on outer distal margin; both lobes of outer ramus bearing 3 elongate distally pectinate spines. Maxillipedal endite distally broad, with 1 coupling hook, 4 fringed setae on mediobasal margin; palp of 5 segments, 4 distal segments setose on medial margins; strong conical spine on endite body near origin of palp. Pereopod 1 shorter than pereopods 2–4; carpus longest segment, bearing 6 distally bipectinate spines on posterior margin, plus several simple setae on medial surface; propodus with simple setae on posterior margin plus several ranks of fringed spines on medial surface; dactylus with terminal fringed spine and several less-robust setae on anterior and posterior margins. Pereopods 2–4 similar, lacking dactylus, with propodi, carpi, and meri slender, cylindrical, bearing elongate setae on posterior margins. Pereopods 5–7 prehensile, robust, becoming progressively shorter posteriorly. Penis slightly longer than basis of pleopod 1, distally bilobed. Pleopod 1 basis with 3 retinacula; rami of equal length, exopod with notch in proximal half, and 3 elongate setae. Pleopod 2, copulatory stylet articulating on inner margin of endopod near base, reaching by half its length beyond rami, distally trifid, with 2 slender elongate lobes shielded basally by third acute process. Uropod with outer ramus triangular, margins setulose; inner ramus half length and $\frac{1}{3}$ basal width of outer ramus, with 2 elongate distal setae.

Female: Integument relatively more tuberculate than in male. Head and pereonites 1–3 similar to male; pereonite 4 only slightly longer than greatest anterior width; coxal plate with 2 marginal tubercles, segment tapering poste-

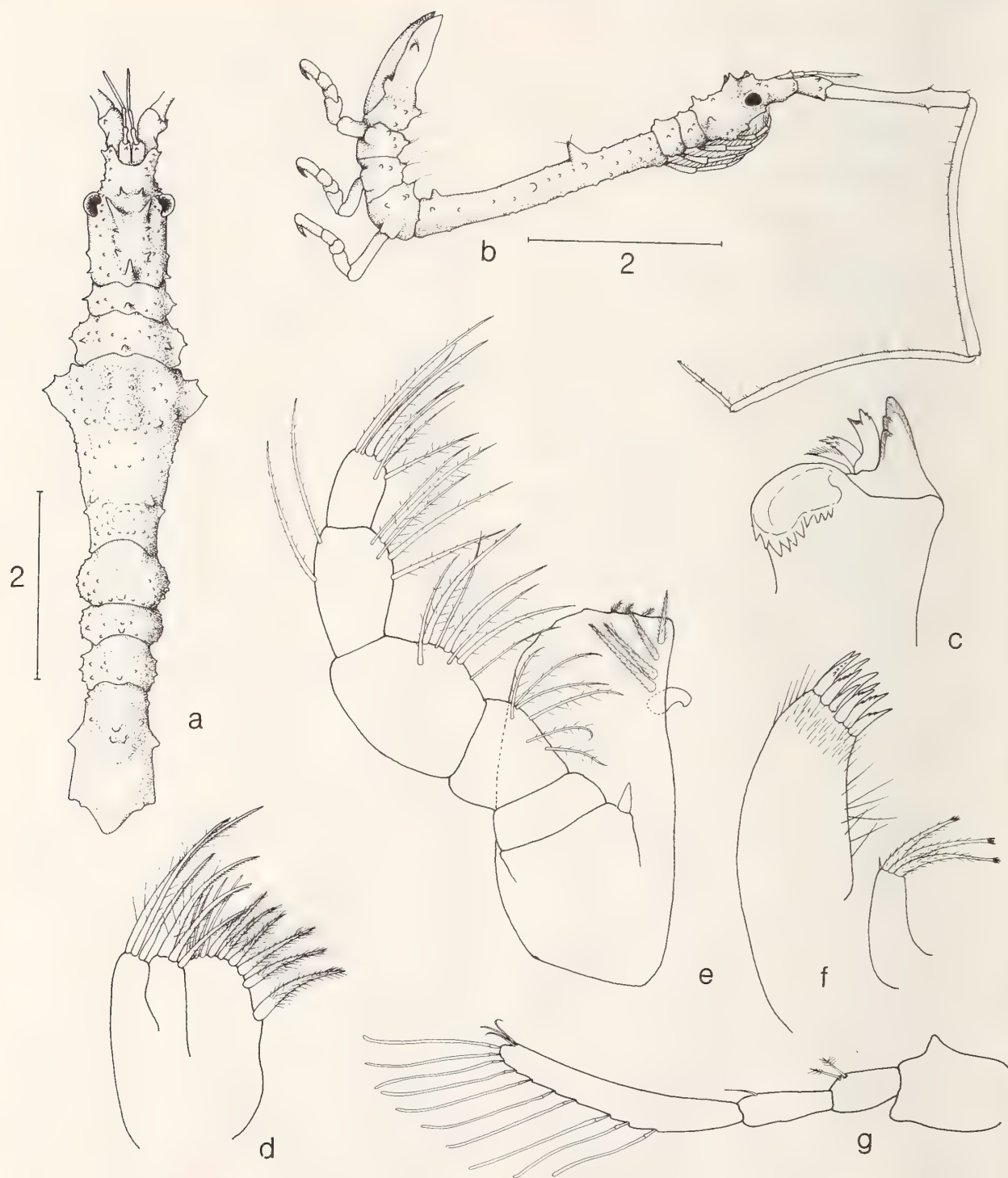


FIGURE 28.—*Astacilla regina*, new species: *a*, ovigerous ♀, dorsal view; *b*, ♂, lateral view; *c*, mandible; *d*, maxilla 2; *e*, maxilliped; *f*, maxilla 1; *g*, antenna 1.



FIGURE 29.—*Astacilla regina*, new species: *a*, uropodal rami; *b*, penis; *c*, pleopod 1, ♂; *d*, pleopod 2, ♂, with apices of copulatory stylet enlarged; *e*, pereopod 1; *f*, pereopod 4.

riorly, with middorsal granular-tuberculate raised area in anterior half. Pereonites 5–7 and pleotelson as in male.

REMARKS.—Two species of *Astacilla* have been recorded from the Caribbean area, viz., *A. cymodocea* Menzies and Glynn and *A. lasallae* Paul and Menzies. The former seems to be an obligate epibiont of seagrasses, especially of *Syringodium filiforme*. The species is always bright green in life and lacks any integumental sculpturing.

Astacilla lasallae was described from as single juvenile male (not a female as stated in the description), collected from Venezuela. This species lacks the conical pairs of tubercles on the head and the middorsal tubercles of the three posterior pereonites and first pleonite. The integument is not tuberculate as in similar-sized males of *A. regina*.

Arcturella sawayae Moreira, 1973, described from a single ovigerous female from southern Brazil, very closely resembles the ovigerous female in the present collection, especially in the integumental sculpturing. The second antenna of the Brazilian species, however, is shorter than in *A. regina*, and the marsupial plate of pereonite 4 is granulate, unlike the smooth plate of *A. regina*. The anterior pereopods (Moreira, 1973, figs. 5 and 6) agree well with those of *Astacilla*.

Menzies and Kruczynski (1983) recorded two new species of *Arcturella* from the central west Florida shelf. (In spite of being assigned to the genus *Arcturella*, these species must be considered, as the confusion between *Astacilla* and *Arcturella* has yet to be resolved.)

The holotype female of *A. bispinata* shows a body form and integumental sculpturing very different from the present species. The female of *A. spinata*, however, has integumental sculpturing very similar to *Astacilla regina*. The following differences serve to separate the two species: the antero- and posteromedian spines on pereonite 4 of the female are much stronger in *A. spinata* than in *A. regina*; the inner ramus of maxilla 2 bears four stout setae in *A. spinata*, three in *A. regina*; the maxillipedal endite of *A. spinata* is distally more rounded and bears more fringed

spines, than in *A. regina*; and the inner uropodal ramus bears three setae in *A. spinata*, two in *A. regina*.

As the male pleopods of *A. spinata* were not figured, no useful speculation on the generic affinities of the Florida species can be made.

Two of the samples from which *A. regina* was collected contained gorgonaceans, *Muriceopsis* cf. *petila* and *Pseudopterogorgia* sp. Whether this is a real association remains to be confirmed.

ETYMOLOGY.—The species is named for Regina Lewis, of Dangriga, Belize, longtime cook for the IMSWE project, as a small token of appreciation for her unflagging efforts in the kitchen.

Suborder ASELOTA

Family STENETRIIDAE

Genus *Stenetrium* Haswell, 1881

Stenetrium bowmani, new species

FIGURES 30, 31

MATERIAL EXAMINED.—*Holotype*: USNM 211293, ♂, TL 5.0 mm, sta K-62, reef slope rubble, 5–8 m.

Paratypes: USNM 211294, 19 ♂, TL 3.8–6.0 mm, 18 ovig ♀, 3.2–5.2 mm, 24 ♀, 3.1–5.0 mm, sta H(81)-36, from *Agaricia* sp. from spur and groove zone, 9.1 m. USNM 211295, 9 ♂, TL 3.3–5.1 mm, 3 ovig ♀, 4.5–5.0 mm, 12 ♀, TL 3.1–4.0 mm, 6 juvs, sta H(81)-4, from *Halimeda* sp. alga on fore reef, 15.2 m.

Additional Material: USNM 211296, 120 ♂, 50 ovig ♀, 112 ♀, 238 juvs, sta H(81)-3, H(81)-5, H(81)-6, H(81)-7, H(81)-16, H(81)-18, H(81)-19, H(81)-20, H(81)-21, H(81)-22, H(81)-23, H(81)-24, H(81)-27, H(81)-39, H(81)-41, H(81)-42, H(81)-45, H(81)-49, H(81)-52, H(81)-53, H(81)-54, H(81)-55, from *Halimeda* sp. alga, and *Agaricia* sp. and *Porites* sp. coral in fore reef slope and spur and groove zone, 1–15.2 mm. USNM 211297, 34 ♂, 25 ovig ♀, 38 ♀, 46 juvs, sta H(80)-16, H(80)-26, H(80)-31, H(80)-32, H(80)-38,

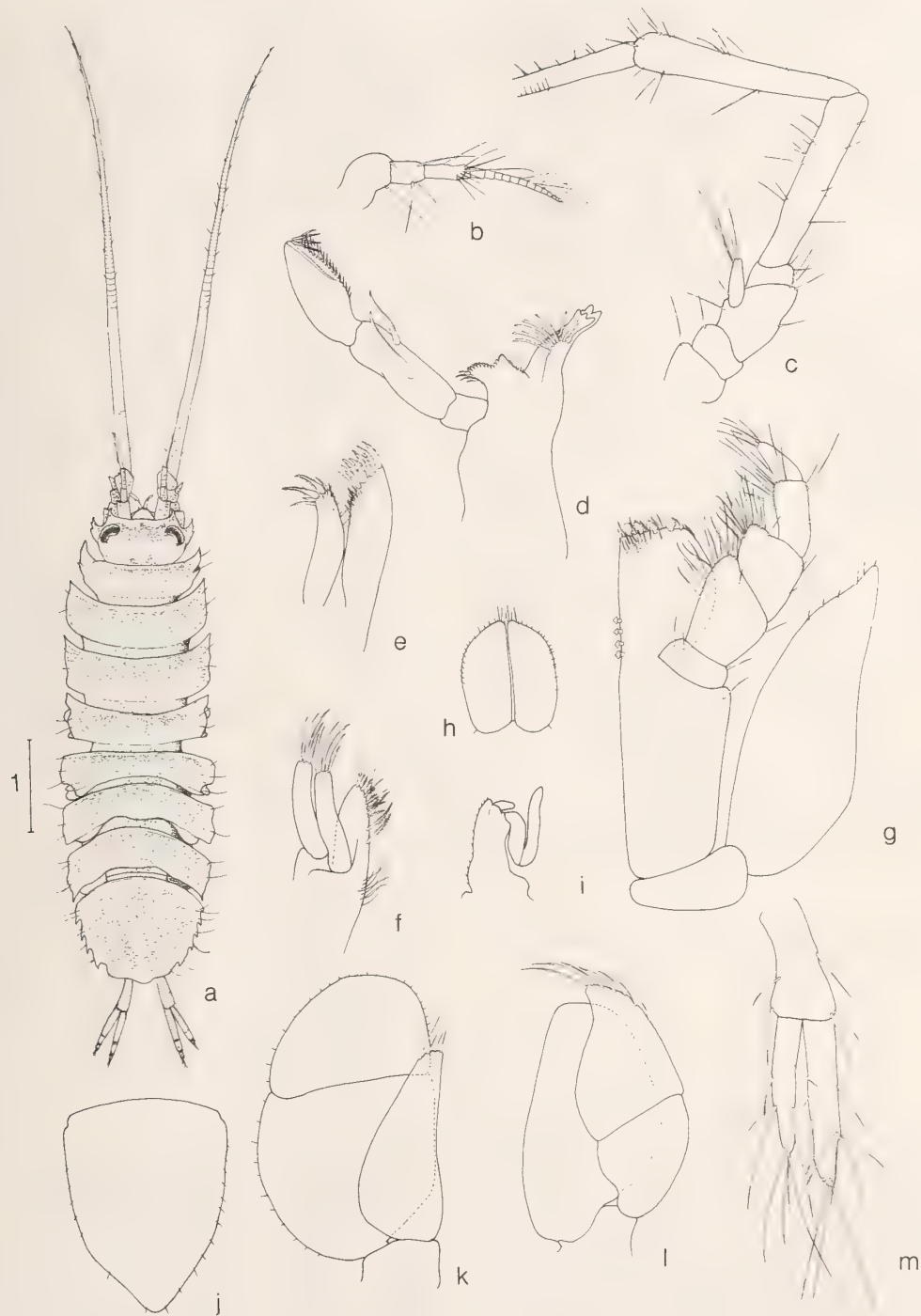


FIGURE 30.—*Stenetrium bowmani*, new species: *a*, whole animal, dorsal view; *b*, antenna 1; *c*, antenna 2, peduncle; *d*, mandible; *e*, maxilla 1; *f*, maxilla 2; *g*, maxilliped; *h*, pleopod 1, ♂; *i*, pleopod 2, ♂; *j*, operculum, ♀; *k*, pleopod 3, ♂; *l*, pleopod 4, ♂; *m*, uropod.



FIGURE 31.—*Stenetrium bowmani*, new species: a, pereopod 1, ♂; b, pereopod 1, ♀; c, pereopod 7.

H(80)-42, fore reef slope, 2–15 m. USNM 211298, 26 ♂, 16 ovig ♀, 18 ♀, 43 juvs, sta K-21, K-35, K-60, K-61, K-62, K-70, K-73, K-74, from rubble on outer reef slope, and on *Halimeda* sp. alga, 1–20 m. USNM 211299, 2 ♂, 1 ♀, sta CBC.4.5.74-3, from reef crest rubble, 0.5 m.

DESCRIPTION.—*Male*: Body about 3 times longer than wide, widest at pereonite 5. Head with dorsolateral eyes well pigmented, well raised above level of lateral margins; anterolateral lobes

of head acutely triangular, outer margins serrate; frontal margin between acute antennal spines straight; rostrum convex, with fine marginal teeth. Anterolateral lobes of pereonites 1–4 acute; posterodistal lobes of pereonites 5 and 6 rounded, of pereonite 7 acute. Pleotelson wider than long, lateral margins with 5 strong teeth; posterior margin between uropodal bases convex.

Antenna 1, basal segment broadest; elongate

simple setae on segments 1–3; flagellum of 14 articles, single aesthetasc on each of 9 distal articles. Antenna 2 slightly longer than total body length; 2 basal peduncle segments short; segment 3 longer than segments 1 and 2 together, bearing setose scale on outer margin; segment 4 about $\frac{1}{4}$ length of segment 3; segments 5 and 6 elongate-cylindrical, segment 6 slightly longer than 5. Mouthparts typical of genus. Maxillipedal endite with 4 coupling hooks on mesial margin. Pereopod 1 large in mature male; merus slightly longer than carpus, posterodistal corner rounded, setose; carpus with fairly strong rounded setose posterodistal lobe; propodus expanded, slightly longer than broad, anterior margin strongly convex and setose, posterior margin with dense fringe of setae; palm with 3 strong conical teeth, posterodistal tooth longest, narrower than 2 inner teeth; dactylus curved, strongly setose, extending well beyond posterodistal palmar tooth. Pereopods 2–7 similar, meri triangular, with anterodistal lobe bearing slender spine; carpi elongate-rectangular, subequal in length to propodi, both armed with short sensory spines on posterior margins; dactyli biunguiculate, 2 ungui equally strong, curved; strong accessory spine on posterior margin. Pleopod 1 proximally parallel-sided, tapering for distal third to rounded apex; outer margin setose. Pleopod 2 typical of genus. Pleopod 3, outer ramus very broadly rounded, with transverse suture in distal half; inner ramus triangular, just reaching beyond suture of outer ramus, with 4 distal setae. Pleopod 4, outer ramus with transverse suture in proximal half, with row of 7 setae on outer distal margin, reaching apex of inner ramus; latter broadly oval. Uropod with basis shorter than rami; outer ramus shorter than inner, both with elongate simple setae.

Female: Pereopod 1 shorter than following pereopods, merus with strong spine at anterodistal angle, posterodistally setose; carpus slightly longer than merus, posterior margin strongly setose; propodus twice longer than wide; posterior margin strongly setose, junction of posterior margin and palm marked by strong fringed spine; palm almost straight, bearing row of finely

serrate spines; dactylus with row of tiny spines on posterior margin. Pleonal operculum longer than wide, distally rounded.

Color: Dorsal integument with small, scattered, red-brown chromatophores, with irregular open patches on head, pleon, and usually on pereonite 4; uropods with very fine chromatophores, and chalky-white patches at distal basis and apex of both rami.

REMARKS.—Of the six species of *Stenetrium* occurring at Carrie Bow Cay, only *S. serratum* Hansen and the present species possess a serrate pleotelson. Hansen's species has a very distinctive color pattern of very fine chromatophores, the double transverse band on the pleon being the most obvious feature. The more evenly scattered and larger chromatophores of *S. bowmani* are very different from *S. serratum*.

Pereopod 1 of the male in *S. serratum* has two spines (the outermost being the larger and curved) on the ill-defined propodal palm, whereas in *S. bowmani*, this appendage has a well-defined palm bearing three spines.

ETYMOLOGY.—The species is named for the late Henry Bowman, Jr., of Dangriga, Belize, whose assistance to the IMSWE project and to the author was invaluable.

Stenetrium minocule Menzies and Glynn, 1968

FIGURE 32

Stenetrium minocule Menzies and Glynn, 1968:72, fig. 38A–E.

MATERIAL EXAMINED.—USNM 211290, 8 ♂, 15 ♀, 2 juvs, sta H(80)-7, H(80)-11, H(80)-18, H(80)-22, H(80)-32, H(80)-35, H(80)-41, from fore reef slope, 15–36 m, from *Thalassia* sea-grass, 1–2 m. USNM 211291, 4 ♂, 4 ♀, sta K-21, K-22, K-35, K-36, rubble from fore reef slope, 11–20 m. USNM 211292, 1 ovig ♀, 10 ♀, sta RC-10, RC-96, RC-99, rubble from reef crest, 0.1 m.

REMARKS.—This species was described from the single female holotype (USNM 118355) taken from the intertidal of Laurel Reef, Puerto

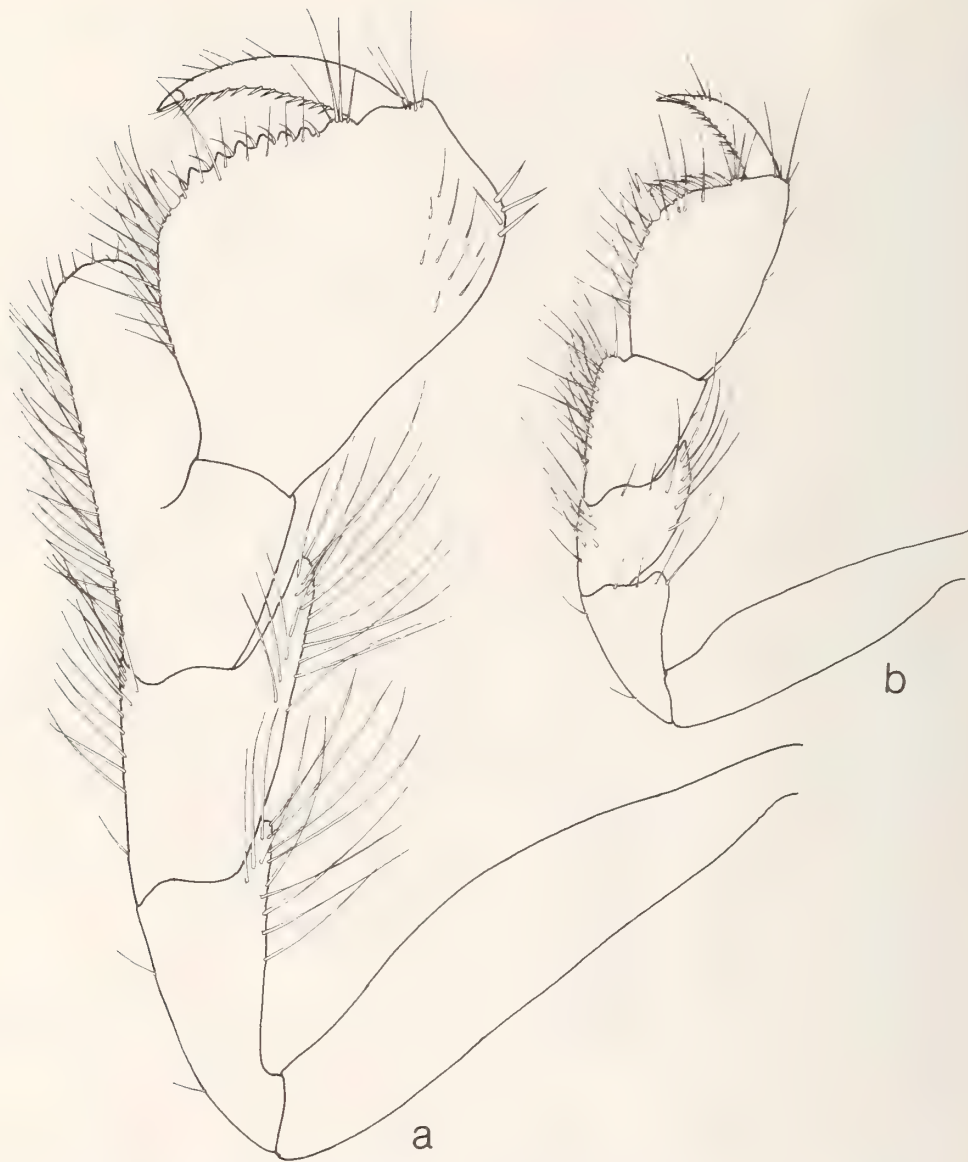


FIGURE 32.—*Stenetrium minocule* Menzies and Glynn: *a*, pereopod 1, ♂; *b*, pereopod 1, ♀.

Rico. With a large collection now available from Belize, it was felt desirable to figure the first pereopod of the male and female.

***Stenetrium patulipalma*, new species**

FIGURES 33, 34

MATERIAL EXAMINED.—*Holotype*: USNM 211284, ovig ♀, TL 2.7 mm, sta H(81)-35, from

Agaricia sp. coral in spur and groove zone, 9.1 m.

Paratypes: USNM 211285, 2 ♀, TL 2.0 mm, 2.1 mm, sta H(80)-11, H(80)-16, from fore reef slope, 27.4 m. USNM 211286, ♂, TL 2.0 mm, 2 ovig ♀, TL 1.9 mm, 2.0 mm, 3 ♀, TL 1.8–2.0 mm, sta H(81)-9, H(81)-11, H(81)-13, H(81)-32, from *Agaricia* sp., *Madracis* sp., and *Porites* sp. corals from fore reef slope, 9.1–15.2 m.

DESCRIPTION.—*Ovigerous Female*: Body 3–4

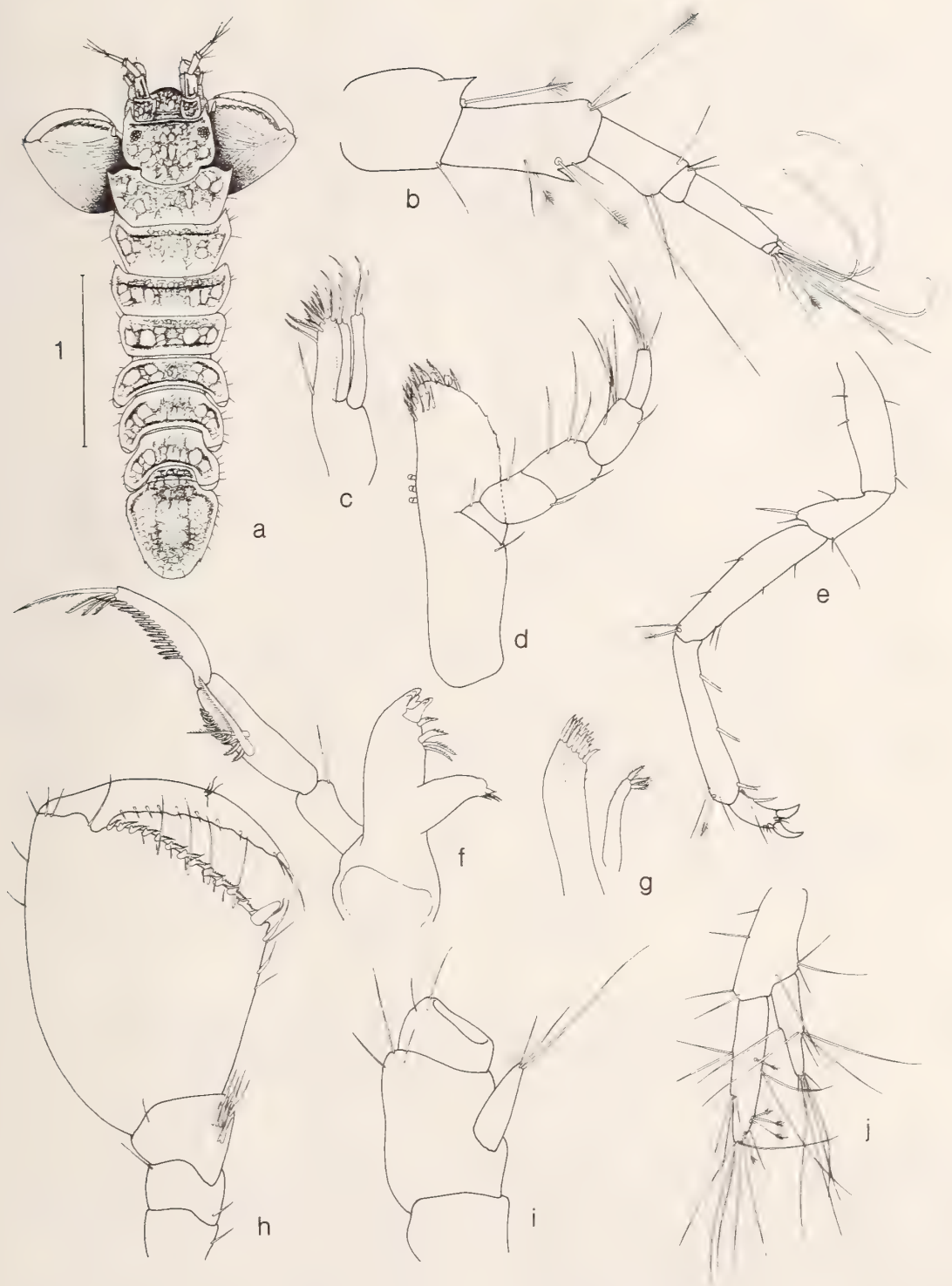


FIGURE 33.—*Stenetrium patulipalma*, new species: *a*, ♀, dorsal view; *b*, antenna 1; *c*, maxilla 2; *d*, maxilliped; *e*, pereopod 7; *f*, mandible; *g*, maxilla 1; *h*, pereopod 1, ♀; *i*, antenna 2, 3 basal segments; *j*, uropod.

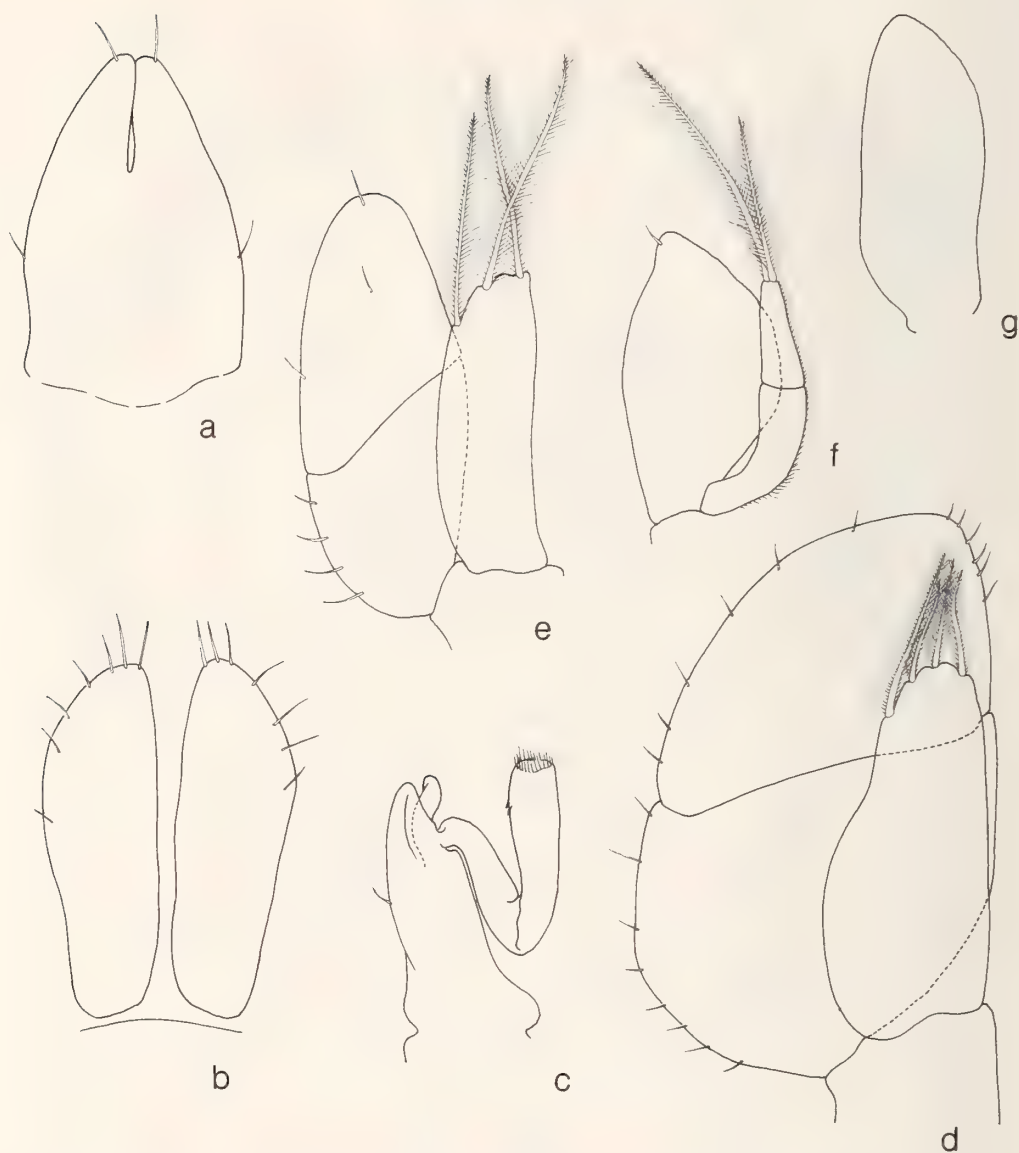


FIGURE 34.—*Stenetrium patulipalmá*, new species: a, operculum, ♀; b, pleopod 1, ♂; c, pleopod 2, ♂; d, pleopod 3, ♂; e, pleopod 2, ♀; f, pleopod 3, ♀; g, pleopod 4.

times longer than wide, widest at pereonite 1. Head with lateral margins entire, anterolateral process acutely triangular, frontal margin straight; narrow rostrum barely defined, anterior margin straight; eyes dorsolateral, of 10 ommatidia. Pereonites 1 and 2 widest anteriorly, with acutely triangular anterolateral angle. Pereonites 3 and 4 with anterolateral angles rounded, 4 narrower than 3; pereonites 5–7 with rounded

posterolateral lobes. Pleon consisting of 1 free pleonite plus pleotelson; latter tapering posteriorly, with single lateral tooth at posterior third; posterior margin between lateral teeth very broadly rounded.

Antenna 1 of 6 articles, basal article with mediobasal spine, article 2 with laterobasal spine; flagellum of 3 articles, 2 subterminal articles each with single aesthetasc, terminal article with 2

aesthetascs. Antenna 2 with only 3 basal segments present in all specimens; segment 2 with distally setose scale. Mouthparts typical of genus. Maxillipedal palp segments all relatively narrow; endite with 3 retinacula. Pereopod 1, carpus distally widened, with 3 irregular rows of spines on posterodistal margin; propodus very broad, widening distally, palm straight, bearing about 12 short blunt sensory spines; demarked posterodistally by strong blunt sensory spine; dactylus curved, narrow, with short unguis and 3 subapical setae; row of short spines on posterior margin. Pereopods 2–7, propodi elongate-rectangular, with 3 slender sensory spines on posterior margin; dactyli biunguiculate, with slender sensory spine on posterior margin. Operculum bluntly triangular, with mediobasal slit reaching back $\frac{1}{3}$ of total length. Pleopod 3, exopod ovate, biarticulate; endopod with 3 distal plumose setae. Pleopod 4, exopod uniramous, with single distal seta; endopod biarticulate, narrow, with 2 elongate distal plumose setae. Pleopod 5 uniramous, elongate-ovate. Uropod, outer ramus shorter than inner, both rami bearing elongate setae.

Male: Single specimen lacking pereopod 1. Pleopod 1, sympod apparently indistinguishably fused with sternum; rami about 3 times longer than wide, widest at distal $\frac{2}{3}$, distal margin with few setae. Pleopod 2, inner ramus with 2 short spines near distal end of flexed tubular process. Pleopod 3 exopod very broad, biarticulate; endopod shorter than exopod, with 4 distal plumose setae.

Color: Upper lip, bases of antenna 1 and antenna 2, dorsal head, pereon, and pleon with red-brown reticulation of pigment; darker transverse line in anterior of pereonites 2 and 3 and posterior of pereonites 4–7.

REMARKS.—Schultz (1982) diagnosed two new genera in the Stenetriidae, *Tenupedunculus* and *Stenetrigus*, in addition to describing another species of *Protallocaloxa*. The latter has since been shown to be a true *Stenetrium* (Wilson, 1980). Many of the features used to separate *Tenupedunculus* from *Stenetrium* occur in the latter genus, e.g., lack of eyes, shape of the cephalic

processes, somewhat elongate antenna 2 peduncle articles, and general body shape. The male and female pleopods (used to diagnose families and genera in the Asellota; see Amar, 1957) in *Tenupedunculus* are identical to those of *Stenetrium*. *Stenetrigus* is separated from *Stenetrium* by the possession of eyes of few ommatidia, and the first male pleopod lacking a sympod. The present species (*Stenetrium patulipalma*) possesses eyes of 10 ommatidia, not in the reniform arrangement common in *Stenetrium*. The rami of the male pleopod 1 appear entirely separate and originating on the sternum. This probably indicates a very reduced sympod and does not constitute a strong enough reason for separation from *Stenetrium*, especially as the pleopodal pattern is identical to the latter genus. For these reasons, the present species is placed in *Stenetrium*, and *Tenupedunculus* and *Stenetrigus* are regarded as synonyms of *Stenetrium*. The species is separated from the other Caribbean species, and indeed from all other *Stenetrium*, by the following combination of characters: color pattern, poorly defined rostrum, very broad posterior pleotelsonic margin, relatively large and broad first pereopods in the female, and the non-reniform arrangement of ommatidia in the eye.

ETYMOLOGY.—The specific epithet is a combination of the Latin *patulus* (broad) plus *palma* (palm) and refers to the very broad propodus of pereopod 1.

Stenetrium spathulicarpus, new species

FIGURES 35, 36, 37d

Stenetrium occidentale.—Menzies and Glynn, 1968:71, figs. 34, 35 [not Hansen, 1904].

MATERIAL EXAMINED.—*Holotype*: USNM 211274, ♂, TL 3.4 mm, sta H(81)-41, from *Agaricia* sp. coral from reef platform, 1–2 m.

Allotype: USNM 211275, ovig ♀, TL 4.1 mm, sta K-35, from rubble on outer reef slope, 20 m.

Paratypes: USNM 211276, 12 ♂, TL 3.9–4.1 mm, 5 ovig ♀, TL 2.8–3.8 mm, 7 ♀, 5 juvs, sta K-35, from rubble on outer reef slope, 20 m.



FIGURE 35.—*Stenetrium spathulicarpus*, new species: *a*, whole animal, dorsal view; *b*, antenna 1; *c*, mandible; *d*, maxilla 2; *e*, uropod; *f*, maxilla 1; *g*, maxilliped; *h*, pleopod 1, ♂; *i*, pleopod 2, ♂; *j*, pleopod 3, ♂; *k*, pleopod 4, ♂; *l*, pleopod 5, ♂; *m*, operculum, ♀.

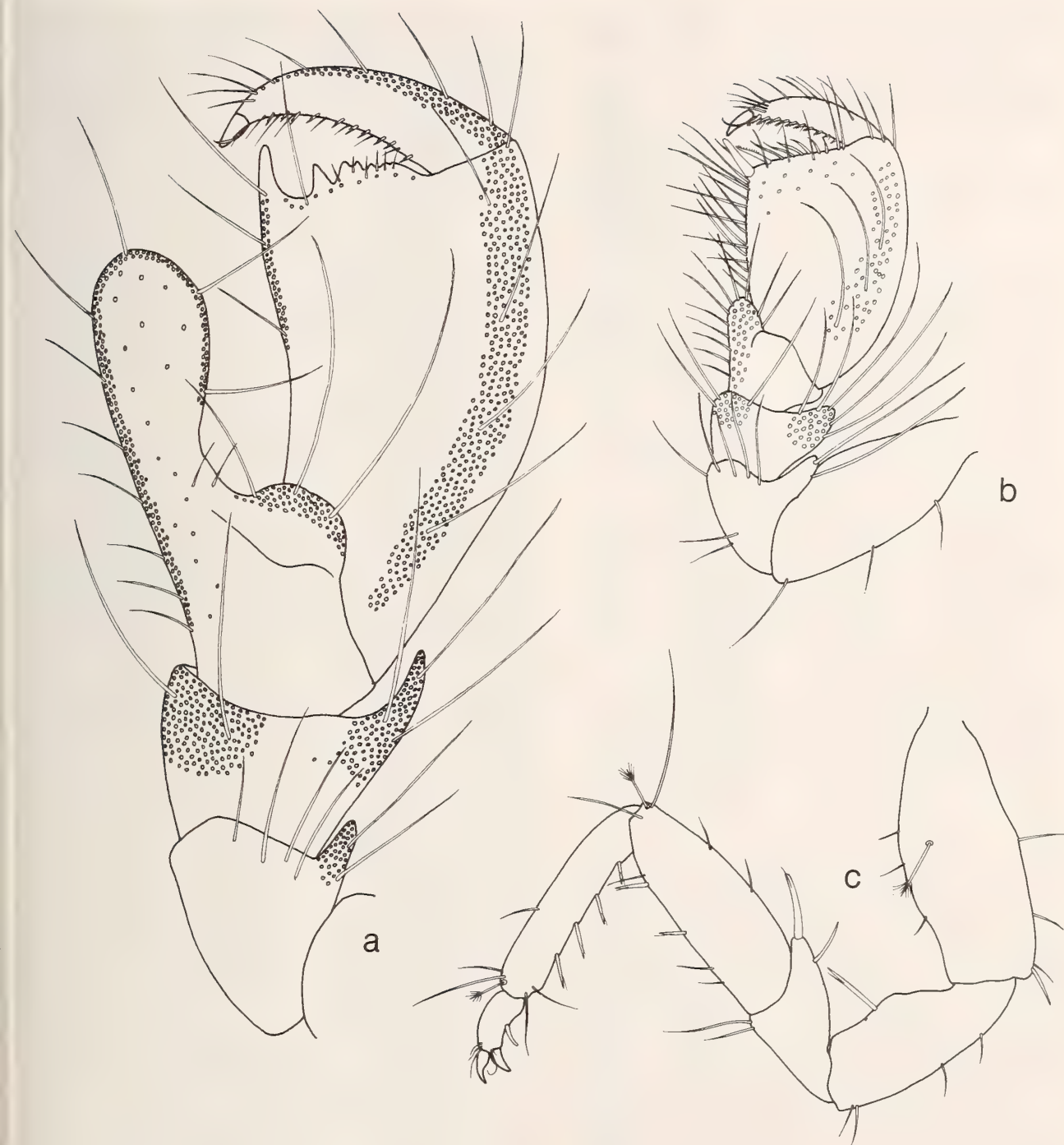


FIGURE 36.—*Stenetrium spathulicarpus*, new species: *a*, pereopod 1, ♂, majority of setae omitted; *b*, pereopod 1, ♀, some setae omitted; *c*, pereopod 7.

USNM 211277, 10 ♂, TL 3.3–4.0 mm, 6 ovig ♀, TL 3.0–3.9 mm, 17 juvs, sta CBC-4.5.74-3, from coral rubble on reef crest, 0.5 m.

Additional Material: USNM 211278, 170 ♂, 112 ovig ♀, 120 ♀, 117 juvs, sta H(81)-7, H(81)-8, H(81)-9, H(81)-10, H(81)-11, H(81)-12, H(81)-13, H(81)-14, H(81)-15, H(81)-16, H(81)-17, H(81)-19, H(81)-20, H(81)-21, H(81)-22, H(81)-26, H(81)-28, H(81)-29, H(81)-32, H(81)-33, H(81)-35, H(81)-36, H(81)-38, H(81)-39, H(81)-40, H(81)-41, H(81)-42, H(81)-45, H(81)-48, H(81)-49, H(81)-51, H(81)-54, H(81)-55, H(81)-57, from *Agaricia* sp., *Madracis* sp., and *Porites* sp. corals, and *Halimeda* sp. alga, on reef crest, spur and groove zone, and fore reef area, 1–15.2 m. USNM 211279, 19 ♂, 12 ovig ♀, 20 ♀, 25 juvs, sta H(80)-11, H(80)-22, H(80)-35, H(80)-36, H(80)-38, H(80)-39, H(80)-40, H(80)-41, H(80)-48, from *Madracis* sp. coral, and *Halimeda* sp. alga, from reef crest, fore reef slope, and *Thalassia* sp. seagrass, 1–36 m. USNM 211280, 17 ♂, 8 ovig ♀, 22 ♀, 21 juvs, sta K-35, K-36, K-38, K-99, K-133, K-135, K-136, K-137, K-144, from rubble on reef crest and fore reef slope, from *Halimeda* sp. alga, from lagoonal patch reef, from *Caulerpa verticillata* alga under red mangroves, 0.2–23, m. USNM 211281, 2 ♂, 1 ♀, sta CBC-7.5.74-1, from reef crest rubble, 0.2 m.

DESCRIPTION.—*Male:* Body narrow, parallel-sided, about 4 times longer than wide. Head with lateral margins entire, with short acute anterolateral corners, rounded antennal lobes; frontal margin straight, rostrum ill-defined, straight and narrow; dorsolateral eyes strongly pigmented, of about 16 ommatidia. Pereonite 1 with acutely triangular anterolateral lobe; pereonites 2 and 3 with anterolateral corners narrowly and broadly rounded respectively. Pereonites 1–3 increasing in length posteriorly; pereonite 4 shortest. Pleon consisting of very short free anterior pleonite plus pleotelson, latter about as long as wide, with very slight posterior taper, lateral margin entire except for single strong tooth in posterior half; posterior margin between lateral teeth semicircular.

Antenna 1 with flagellum of 9 articles, 7 distal articles each with single aesthetasc; elongate simple setae on peduncle segments 2 and 3. Mouthparts typical for genus. Maxillipedal endite distally broad, with 5 retinacula on medial margin. Pereopod 1 relatively large in mature male; anterodistal process of ischium and merus and posterodistal surface of merus densely setose; carpus strong distally rounded spoon-shaped posterodistal lobe reaching nearly to palm of propodus, bearing dense marginal setae, well separated from posterior margin of propodus, with rounded setose area along posterior propodal articulation; propodus longer than wide, anterior margin convex, palm with strong posterodistal tooth separated by large gap from 5 or 6 short teeth, medial surface with dense band of elongate simple setae near anterior margin; dactylus just extending beyond palm, but not reaching posterodistal carpal lobe; anterior margin with dense band of elongate setae, cutting edge with single row of short sensory spines. Ambulatory pereopods with triangular meri bearing strong anterodistal sensory spine; carpi with 2–3 slender sensory spines on posterior margins; propodi narrow-rectangular, with 4 slender sensory spines on posterior margins; dactyli biunguiculate, with additional single short spine on posterior margin. Pleopod 1, rami parallel-sided in proximal half, tapered and marginally sparsely setose in distal half. Pleopod 2 typical of genus. Pleopod 3, outer ramus very broad, biarticulate; inner ramus narrow, just reaching beyond base of distal exopod articulation, with 4 apical plumose setae. Pleopod 4, outer ramus biarticulate, distal article triangular, with 8 plumose setae on outer distal margin; endopod of single article, shorter and broader than exopod. Pleopod 5 of single broad ramus, with 5 plumose setae on oblique-truncate distal margin. Uropod, inner ramus slightly longer and broader than outer, both bearing very elongate distal setae.

Ovigerous Female: Pereopod 1 with dense clumps of simple setae on anterodistal and posterodistal part of merus and posterior margin of slightly produced and rounded carpal lobe; pro-

podus longer than wide, with fairly dense elongate setae on posterior margin and inner anterior surface; straight propodal palm with strong posterodistal spine and row of very finely serrate slender spines; dactylus with row of short serrate spines on cutting margin. Pleonal operculum about $\frac{1}{3}$ longer than wide, distally narrowly rounded.

Color: Head with dark brown anteromedially pointed band of pigment between eyes; anterior margin with narrow dark marginal band. Rostrum and labrum bearing fairly dense reticulation of pigment. Posterior half of head, all pereonites, and pleon with scattered thin reticulation of dorsal pigment, sometimes forming ill-defined anterior and posterior transverse lines on pereonites.

REMARKS.—The present species could be confused with a complex of three West Indian species, especially if mature male material were not available. These three species are *S. stebbingi* Richardson, 1902 (from Bermuda), *S. occidentale* Hansen, 1904 (from St Thomas, West Indies), and *S. antillense* Hansen, 1904 (from West Indies, probably 100 fathoms). Re-examination of Menzies and Glynn's 1968 material from Puerto Rico shows it to be *S. spathulicarpus*. Menzies and Glynn did suggest that the three earlier species might be conspecific, along with *S. medipacificum* from Hawaii and *S. gilbertense* from the Gilbert Islands. The latter two species are almost certainly not closely related to the West Indian species. Examination of material of *S. stebbingi* (the name with priority) from Belize, as well as the types of the three earlier species, strongly suggests a single species, slightly variable in the structure of the male pereopod 1 (which in turn depends on the degree of maturity of the specimen). Menzies and Kruczynski (1983) do synonymize the three earlier species.

Stenetrium spathulicarpus may be separated from *S. stebbingi* on several features (see following tabulation), which may be thought to be unduly subtle, but which are fully as obvious as features used in the past to define species of *Stenetrium* (e.g., see Kensley, 1980).

| | <i>S. stebbingi</i> | <i>S. spathulicarpus</i> |
|------------------------------------|----------------------------------|--------------------------------------|
| Pigment pattern | no band between eyes | strong band between eyes |
| Eye shape | bunched | narrow, curved |
| Carpal lobe of pereopod 1 | apically acute | apically rounded |
| Propodal palm | barely defined | well defined |
| Dactylus of pereopod 1 in mature ♂ | overreaching carpal lobe apex | not overreaching carpal lobe apex |

ETYMOLOGY.—The specific epithet is derived from the Latin *spathula* (spoon) plus *carpus* (wrist) and refers to the carpal lobe of pereopod 1 in the male.

Stenetrium stebbingi Richardson, 1902

FIGURE 37a-c

Stenetrium stebbingi Richardson, 1902:295, pl. 39: figs. 46–49; 1905:444, figs. 499–501.—Hansen, 1904:325.—Menzies and Glynn, 1968:71.—Schultz, 1969:240, fig. 377.—Menzies and Kruczynski, 1983:97, fig. 33.
Stenetrium antillense Hansen, 1904:326, pl. 20: fig. 3, pl. 21: fig. 1.—Richardson, 1905:446, fig. 502.—Wolff, 1962:25.—Menzies and Glynn, 1968:71.—Schultz, 1969:240, fig. 376.—Menzies and Kruczynski, 1983:97.
Stenetrium occidentale Hansen, 1904:324, pl. 20: fig. 2.—Richardson, 1905:441, fig. 498.—Wolff, 1962:25.—Menzies and Glynn, 1968:71, figs. 34, 35.—Schultz, 1969:239, fig. 375.—Menzies and Kruczynski, 1983:97.

MATERIAL EXAMINED.—**Syntypes:** USNM 24877, 4 ♂, Bermuda. USNM 24878, 3 ♀, Bermuda, 1–12 ft. USNM 211287, ♂, sta H(80)-22, fore reef slope, 36 m. USNM 211288, 2 ♂, 4 ♀, 1 juv, sta H(81)-33, H(81)-35, H(81)-36, from *Agaricia* sp. coral in spur and groove zone, 9.1 m. USNM 211289, 4 ♂, ovig ♀, 3 ♀, 4 juvs, sta K-136, from *Halimeda* sp. on patch reef, 6 m.

Additional Material: Lectotype ♂ of *S. antillense*, Copenhagen Museum, West Indies, in coral, 100 fms (50 m). Lectotype ♂ of *S. occidentale*, Copenhagen Museum, St. Thomas, West Indies, 12–15 fms (6–7.5 m).

REMARKS.—The distal part of pereopod 1 of a syntype male of *S. stebbingi* and of the lectotype male of *S. antillense* and *S. occidentale* are illustrated in Figure 37.

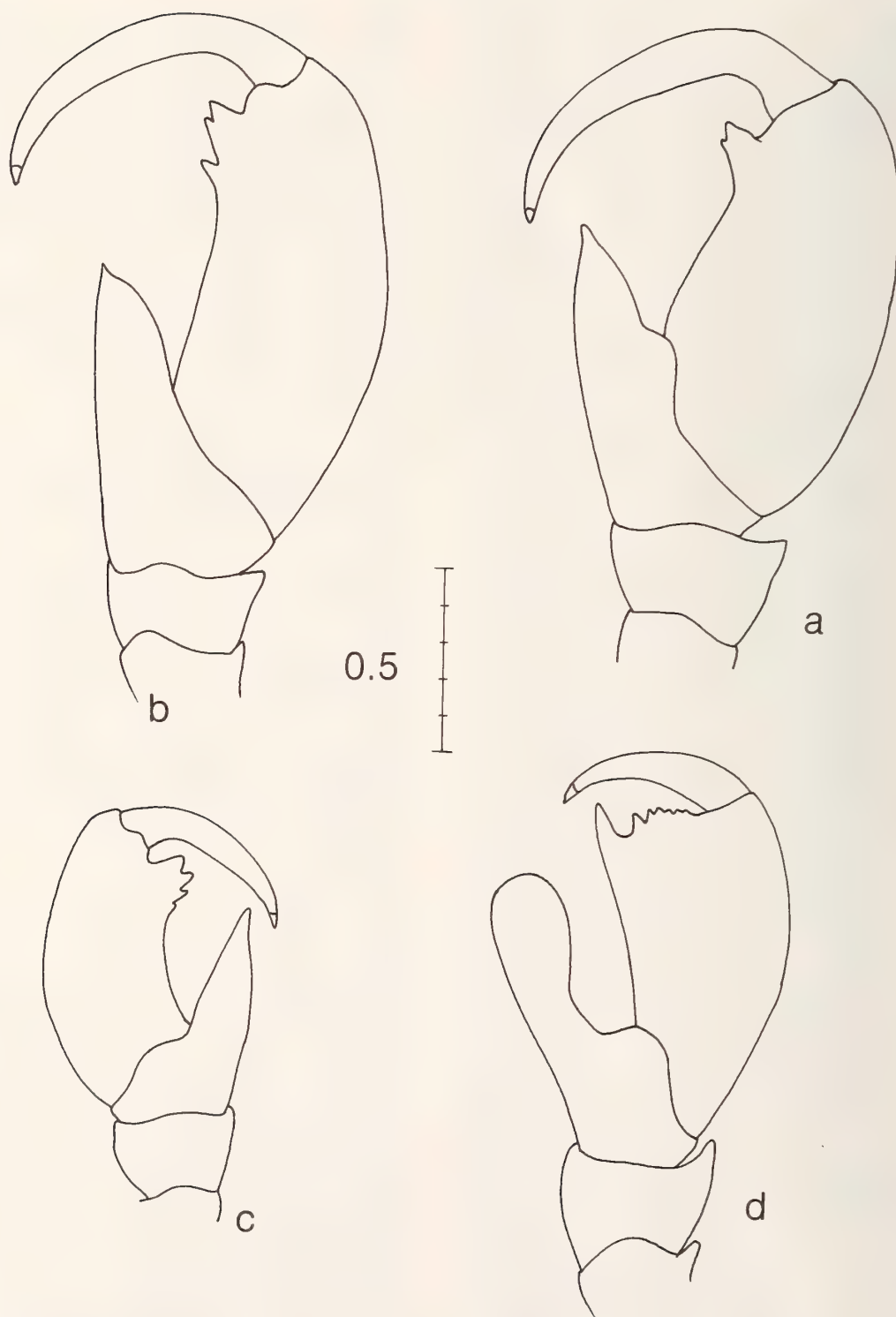


FIGURE 37.—*Stenetrium stebbingi* Richardson: *a*, pereopod 1, lectotype ♂ of *S. antillense*; *b*, pereopod 1, syntype of *S. stebbingi*; *c*, pereopod 1, lectotype ♂ of *S. occidentale*. *Stenetrium spathulicarpus*: *d*, pereopod 1, ♂. (Setae omitted on all figures.)

Family JANIRIDAE

Genus *Bagatus* Nobili, 1906*Bagatus punctatus*, new species

FIGURES 38, 39

MATERIAL EXAMINED.—*Holotype*: USNM 211300, ♂, TL 2.1 mm, sta H(81)-49, from *Porites* sp. coral on reef flat, 1–2 m.

Allotype: USNM 211301, ovig ♀, TL 2.8 mm, sta H(81)-48, from *Porites* sp. coral on reef flat, 1–2 m.

Paratypes: USNM 211302, 2 ♂, TL 1.9–2.0 mm, 1 ovig ♀, TL 2.3 mm, sta H(81)-48, from *Porites* sp. coral on reef flat, 1–2 m. USNM 211303, ovig ♀, TL 2.2 mm, 2 ♀, 1.9–2.0 mm, sta H(81)-49, from *Porites* sp. coral on reef flat, 1–2 m. USNM 211304, ♂, TL 2.2 mm, sta H(81)-52, from *Porites* sp. coral on reef flat, 1–2 m. USNM 211305, 3 ♂, TL 2.0–2.2, 2 ovig ♀, TL 2.5–2.6 mm, sta CBC-15.1.76-2, rubble from reef crest, 0.1 m.

Additional Material: USNM 211306, 3 ♂, 2 ovig ♀, 1 ♀, sta RC-3, RC-18, RC-84, RC-97, reef crest rubble, 0.1 m. USNM 211307, 3 ovig ♀, 1 ♀, sta H(81)-9, H(81)-16, H(81)-50, from *Porites* sp. and *Agaricia* sp. corals on fore reef, 1–15.2 m. USNM 211308, 1 ♂, 3 ♀, sta H(80)-6, Glovers Reef, Belize, 0–3 m. USNM 211309, 1 ♂, 3 ♀, sta CBC-14.1.76-3, reef crest rubble, 0.1 m.

DESCRIPTION.—*Male*: Body 2.5 times longer than wide, widest at pereonite 6. Head with frontal margin gently convex; anterolateral corners rounded; lateral margins entire; well-pigmented dorsolateral eyes. Pereonites widening very slightly posteriorly; pereonite 1, anterolateral corner acute, all other pereonites rounded. Coxae visible on all pereonites. Pleotelson wider than long; lateral margins tapering posteriorly, concave at uropodal insertions, broadly rounded between uropods.

Antenna 1 of 7 articles, 2 distal articles each with single aesthetasc. Antenna 2 with short setose scale on peduncle segment 2, 3 proximal segments short, 2 distal segments elongate, seg-

ment 5 slightly longer than 4; flagellum of 24 setose articles. Mandibular palp, segment 2 bearing 3 distal fringed spines; terminal segment curved, with 11 spines, distal 5 becoming progressively longer; molar distally broadly truncate; incisor of 6 cusps; 6 spines in spine row. Maxilla 1, inner ramus with 4 simple spines; outer ramus with 10 serrate spines. Maxilla 2, inner ramus with dense simple and serrate spines; inner lobe of outer ramus with 3 spines, outer lobe with 4 spines. Maxillipedal endite with 2 retinacula on medial margin, distal margin with about 12 fringed setae; 3 basal palp segments broad, 2 distal segments narrow. Pereopod 1, carpus 1.5 times longer than wide, with strong posterodistal triangular process and strong rounded lobe on distal margin, numerous setae on posterior margin; propodus curved, longer than distal carpal margin, with 3 rounded processes on posterior margin; dactylus short, biunguiculate. Pereopods 2–7 similar, carpi and propodi with 2 and 3 sensory spines respectively on posterior margin; dactyli biunguiculate. Pleopod 1, outer lobe of ramus narrowly acute, extending well beyond broadly angular inner setose lobe. Pleopod 2, inner ramus narrowly tapering, reaching beyond broadly rounded outer ramus, latter bearing 7 distal setae. Pleopod 3, inner ramus about 3½ times width of outer ramus, with 3 strong distal plumose setae; outer ramus with 4 simple distal setae, outer margin densely setulose. Uropodal peduncle slightly shorter than outer ramus, latter slightly shorter than inner ramus; rami tapering, with elongate distal setae.

Ovigerous Female: Pereopod 1, carpus broadest at midlength, lacking free distal margin; posterior margin armed with about 12 strong sensory spines; propodus lacking armature on posterior margin except for single posterodistal sensory spine; dactylus biunguiculate. Operculum slightly broader than long, distal margin broadly bilobed, setose.

Color: Large dark-brown chromatophores on antennal peduncles, upper lip, and uropods. Entire dorsum of body with dense chromatophores in patchy and reticulate arrangement.



FIGURE 38.—*Bagatus punctatus*, new species: *a*, whole animal, dorsal view; *b*, antenna 1; *c*, antenna 2; *d*, mandible; *e*, uropod; *f*, maxilla 1; *g*, maxilla 2; *h*, maxilliped.

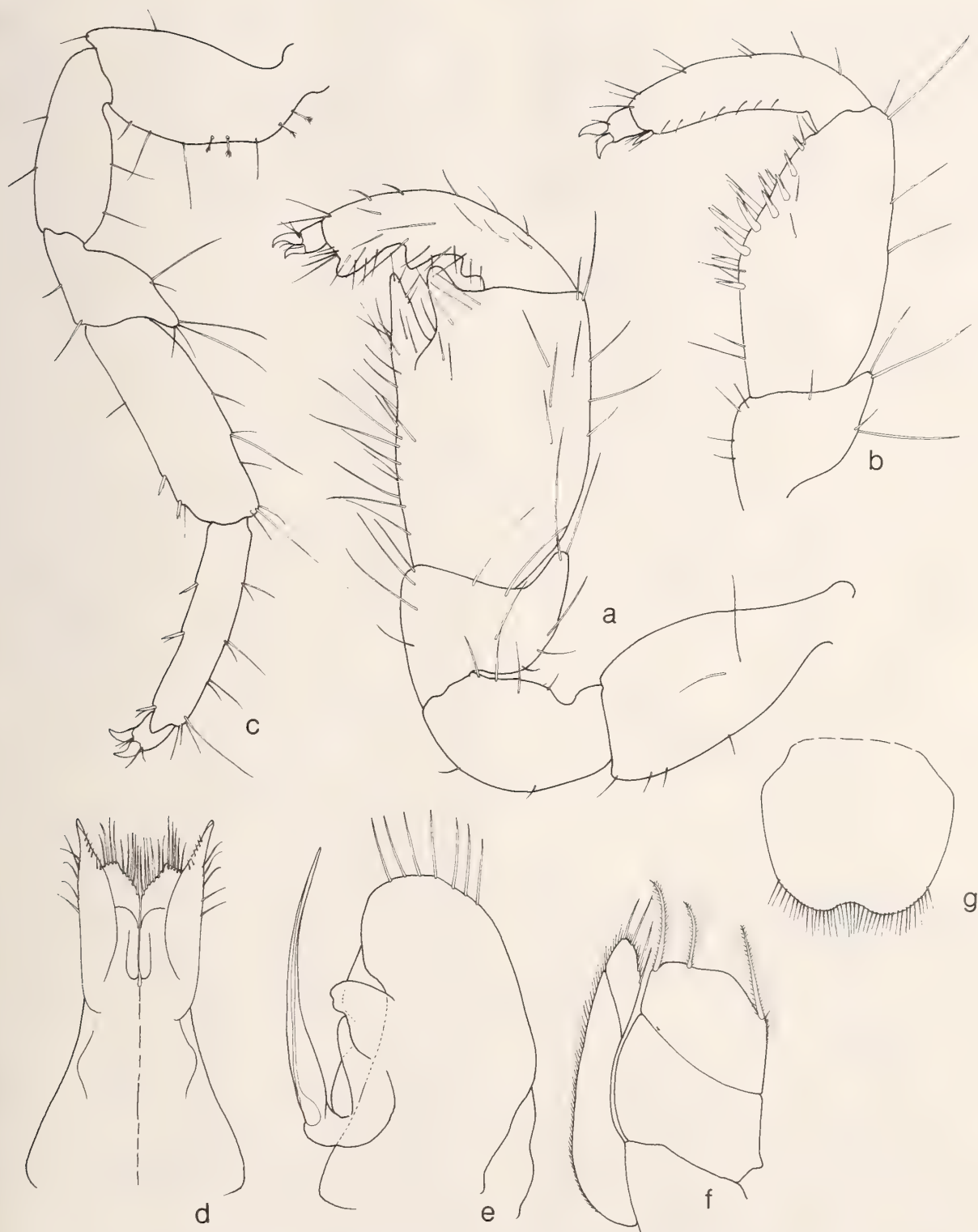


FIGURE 39.—*Bagatus punctatus*, new species: a, pereopod 1, ♂; b, pereopod 2; c, pereopod 7; d, pleopod 1, ♂; e, pleopod 2, ♂; f, pleopod 3, ♂; g, operculum, ♀.

REMARKS.—Pires (1982), in a revision of *Bagatus*, divided the 12 species into two groups based on the structure of the male pereopod 1 and pleopod 2. The sympod of pleopod 2 is setose, a feature of the "stylodactylus" group. Based on pereopod 1 structure, however, the present species falls into the "minutus" group and closely resembles *B. brucei* Monod, from the Indo-West Pacific. The two species can be separated by the pleotelson structure (posteriorly more strongly produced in *B. punctatus*), the male pereopod 1 (inner carpal tooth rounded in *B. punctatus*, acute in *B. brucei*; propodus with two teeth in *B. brucei*, three in *B. punctatus*), and pleopod 1 in the male (the inner distal lobe is barely demarked in *B. brucei*, well demarked and angular in *B. punctatus*). The latter bears little resemblance to any of the species previously recorded from the western Atlantic.

ETYMOLOGY.—The specific epithet refers to the large, dark-brown dorsal chromatophores of both the male and the female.

Family MICROPARASELLIDAE

Genus *Angliera* Chapuis and Delamere-Deboutteville, 1955

Angliera psamathus, new species

FIGURE 40

MATERIAL EXAMINED.—*Holotype*: USNM 211322, ♂, TL 1.0 mm, from interstitial water, intertidal sand bank, east side of Carrie Bow Cay.

Paratypes: USNM 211323, 8 ♂, TL 1.0 mm, 2 ovig ♀, TL 1.0 mm, 6 ♀, TL 1.0 mm, from interstitial water, intertidal sand bank, east side of Carrie Bow Cay.

DESCRIPTION.—*Male*: Body 7 times longer than wide, widest in anterior head region. Head with anterior margin faintly trilobed, about twice length of pereonite 1. Pereopodal insertions anterodorsal in pereonites 1–4, posterodorsal in pereonites 5–7. Pleon of 1 free segment, $\frac{1}{4}$ mid-dorsal length of pleotelson; latter about $1\frac{1}{3}$ times longer than wide; posterior margin with low mid-dorsal concavity.

Antenna 1 of 7 articles, articles 1 and 2 longest; 2 distal articles each with single aesthetasc. Antenna 2, peduncle of 5 articles, subequal in length to flagellum of 8 articles. Mandibular palp 3-articulate, articles decreasing in length and width distally; terminal article strongly hooked; masticatory processes directed mediolaterally, asymmetrical; right mandible with 2 outer fixed spinose teeth and 2 inner articulated spinose teeth; left mandible with 3 fixed and 1 mobile spinose teeth. Maxilla 1, inner lobe broadly oval, with 4 elongate simple setae medially and 9 shorter fringed setae mediodistally; outer ramus with 10 sinuous distally pectinate spines, 1 simple, 1 fringed, and 1 distally pectinate spine near mediodistal angle. Maxilla 2, inner ramus basally curved, with 3 elongate fringed and 2 simple apical setae, 3 elongate fringed setae on medial margin; inner lobe of outer ramus somewhat longer than outer, both bearing 4 elongate fringed setae distally. Maxilliped with 4-articulate palp, basal article about twice longer than wide, with inner distal angle acute; article 2 $\frac{1}{3}$ length of 3; latter nearly 3 times longer than wide; distal article with broadly cylindrical proximal part and tapering curved spinulose distal part; endite broadly truncate, inner distal angle right-angled; medial margin with 2 coupling hooks, with single elongate fringed seta nearby, 5 more distal fringed setae; distal margin bearing 6 basally stout and distally whip-like fringed setae, and single distolateral slender seta. Pereopod 1 shorter than following legs; carpus with single sensory spine on posterior margin; propodus distally broader than proximally, with single posterodistal sensory spine; dactylus with 4 hooked ungui, distalmost longest. Pleopod 1 basally broad, fused with triangular medial structure, tapering somewhat, lobes distally broadly rounded. Pleopod 2 with outer ramus appearing distally hooded; inner ramus with fine whip-like distal part. Uropod biramous, inner (distal) ramus subequal in length to peduncle; outer lateral ramus $\frac{2}{3}$ length of inner.

Female: Operculum $1\frac{1}{3}$ wider than long, distally broadly bilobed.

REMARKS.—With Stock's (1977) description

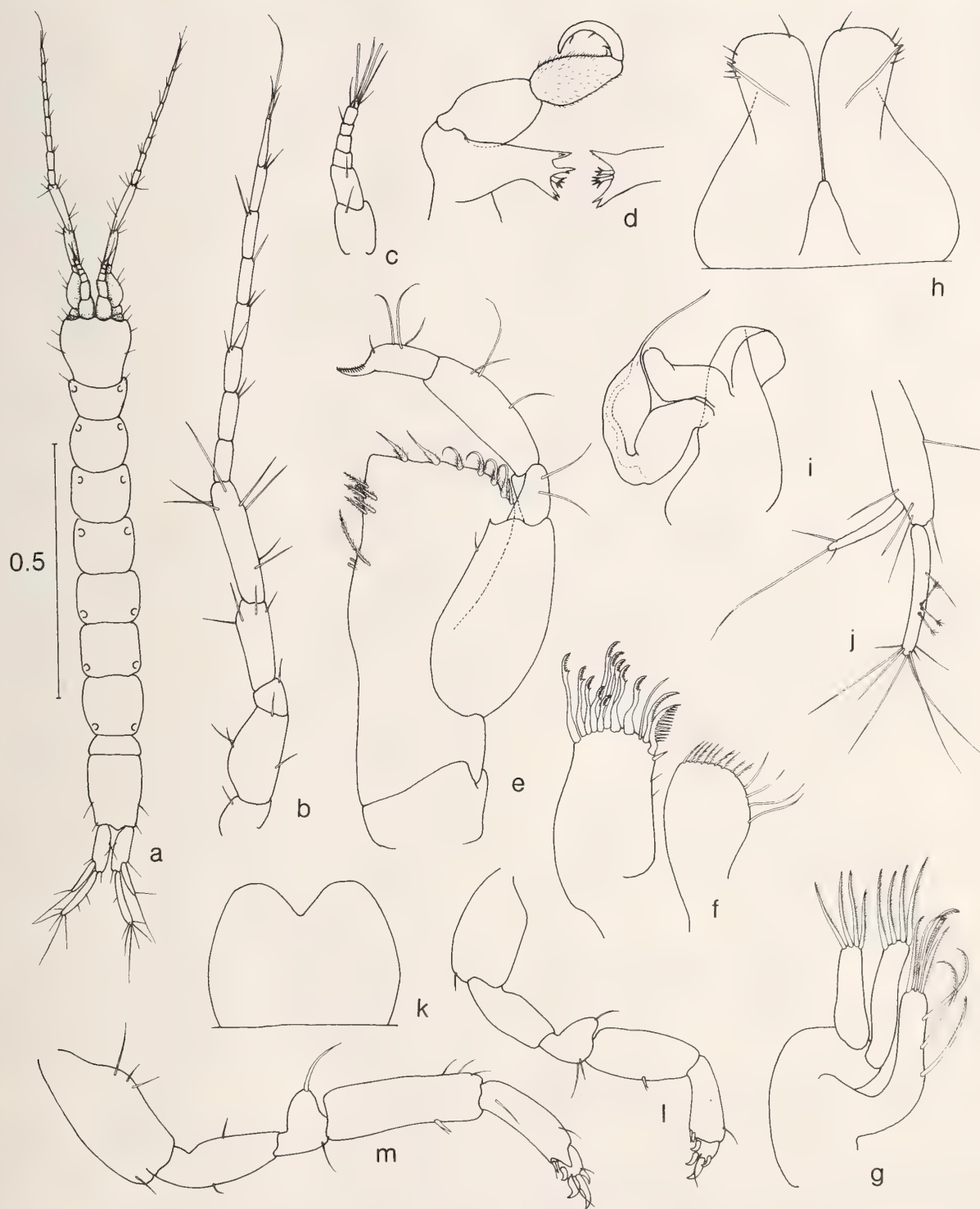


FIGURE 40.—*Angliera psamathus*, new species: *a*, whole animal, dorsal view; *b*, antenna 2; *c*, antenna 1; *d*, mandibles; *e*, maxilliped; *f*, maxilla 1; *g*, maxilla 2; *h*, pleopod 1, ♂; *i*, pleopod 2, ♂; *j*, uropod; *k*, operculum, ♀; *l*, pereopod 1; *m*, pereopod 7.

of *Angliera dubitans* from Bonaire, six species and subspecies of this genus had been described. As Stock (1977) noted, differences between species, and especially between *A. racovitzai* from Cuba and *A. dubitans*, are subtle. The present species differs from the Bonaire species in five features: the outer ramus of the male pleopod 2 appears hooded in *A. psamathus* but not in *A. dubitans*; the distal margin of the maxillipedal endite bears five setae in *A. dubitans*, seven in *A. psamathus*; the outer ramus of maxilla 1 bears 10 rather than nine distally pectinate spines in *A. psamathus*; the pereopods are relatively more slender and elongate in the Belize species; and the inner uropodal ramus is subequal in length to the peduncle in *A. psamathus*, longer than the peduncle in *A. dubitans*.

Differences from the Cuban species may be seen in the maxillipedal palp (the terminal claw-like part of the last segment being more demarcated in *A. psamathus*) and in the posterior pereopods (*A. racovitzai* lacks a small claw dorsal to the main dactylar claw).

ETYMOLOGY.—The specific epithet is derived from the Greek *psamathos* (sand of the seashore) and refers to the habitat of the species.

Genus *Microcharon* Karaman, 1934

Microcharon sabulum, new species

FIGURE 41

MATERIAL EXAMINED.—*Holotype*: USNM 211324, ♀, TL 1.4 mm, interstitial, from coarse calcareous intertidal sand on east side of Carrie Bow Cay.

Paratypes: USNM 211325, 17 ♂, TL 1.0–1.4 mm, 12 ♀, TL 1.0–1.5 mm, interstitial, from coarse calcareous sand, east side of Carrie Bow Cay.

DESCRIPTION.—*Male*: Body 7.5 times longer than wide, widest at head midlength. Rostrum narrowly rounded. Pleon consisting of 1 short pleonite plus pleotelson; latter posteriorly trilobed.

Antenna 1, of 5 articles, distal article having single aesthetasc. Antenna 2 with strong scale on peduncle article 3; article 3 short; articles 5 and 6 elongate, subequal; flagellum of 8 articles. Mandibular palp 3-segmented, segment 2 longest, bearing 2 distal fringed spines on outer margin; segment 3, median margin convex, with strong terminal and 3 shorter fringed spines on outer margin; incisor of 4 cusps; lacinia mobilis strong, multidentate; spine row with 2 serrate and several fine simple spines. Maxilla 1, inner ramus slender, with simple distal setae; outer ramus with 11 apical spines. Maxilla 2, inner ramus with several simple spines and 1 strongly pectinate spine; 2 lobes of outer ramus each bearing 4 elongate spines. Maxillipedal palp with segments 2 and 3 expanded; endite with 7 setae on rounded distal margin; 2 coupling hooks on mesial margin. Pereopod 1, propodus curved-rectangular, with 2 sensory spines on posterior margin; dactylus biunguiculate. Pereopod 7, carpus with single posterior sensory spine; propodus with 2 posterior sensory spines; dactylus biunguiculate. Pleopod 1, lobes of ramus distally evenly convex, sparsely setose. Pleopod 2, apex of outer ramus narrowly rounded. Pleopod 3, endopod bearing 3 plumose setae; narrow exopod biarticulate, with single distal seta. Uropodal peduncle equal to pleotelson in length; outer ramus bearing 2 apical setae, $\frac{2}{3}$ length of outer ramus; latter with about 9 distal setae.

Female: Operculum broadly oval, with distal margin very faintly indented.

REMARKS.—As with all the true marine species of *Microcharon*, the present species possesses a 5-articulate antenna 1, a third pleopod bearing three plumose setae, short pereopodal dactyli, and a strongly pectinate spine on the inner ramus of maxilla 2.

Two species of *Microcharon* have been described from the Caribbean area: *M. phreaticus* Coineau and Botosaneanu, 1973, from Cuba, and *M. herrerae* Stock, 1977, from Bonaire. The former, a freshwater interstitial form, lacks plumose setae on pleopod 3, has relatively elongate pereopodal dactyli, and lacks a strongly pectinate

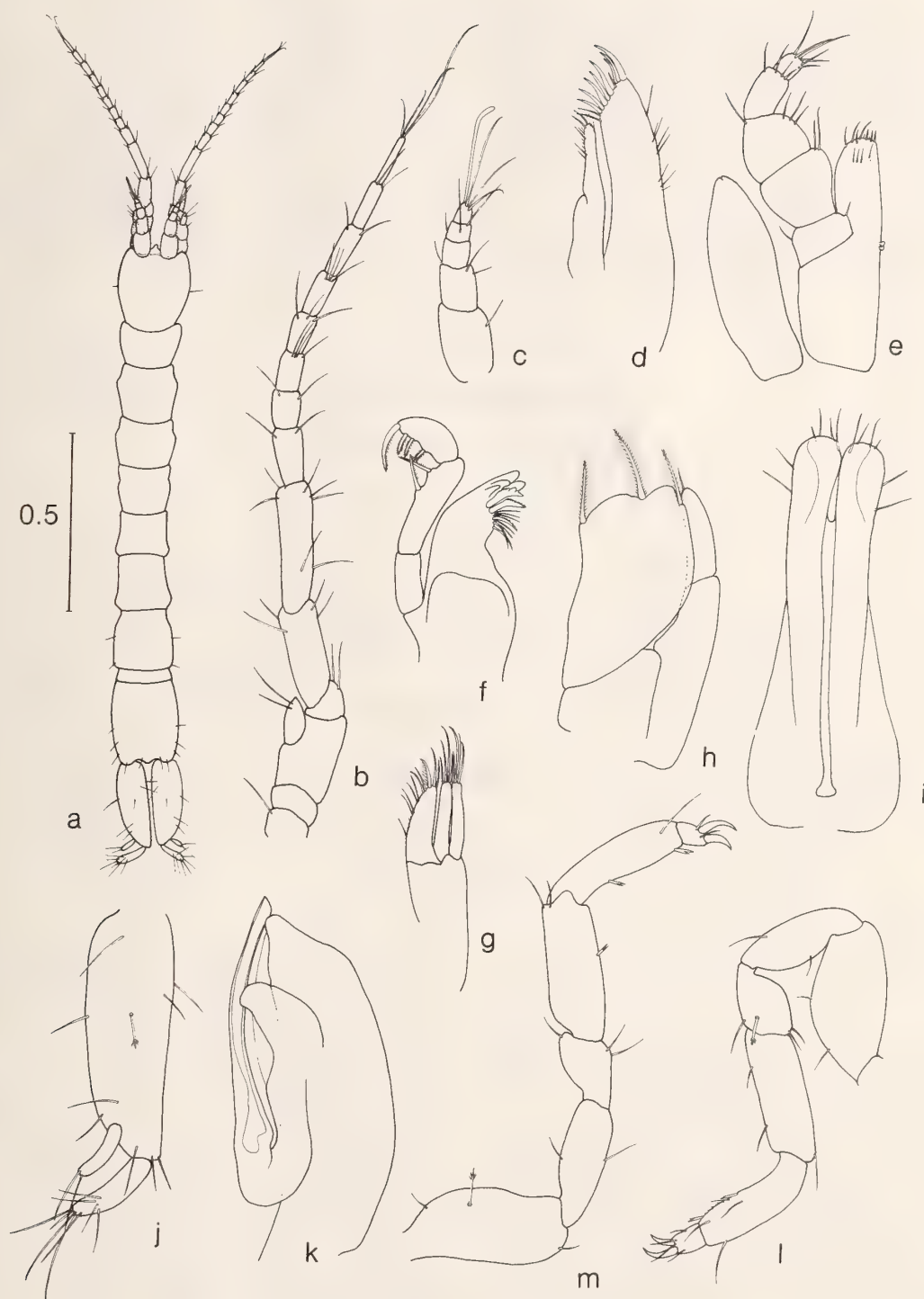


FIGURE 41.—*Microcharon sabulum*, new species: *a*, whole animal, dorsal view; *b*, antenna 2; *c*, antenna 1; *d*, maxilla 1; *e*, maxilliped; *f*, mandible; *g*, maxilla 2; *h*, pleopod 3; *i*, pleopod 1, ♂; *j*, uropod; *k*, pleopod 2, ♂; *l*, pereopod 1; *m*, pereopod 7.

spine on the inner ramus of maxilla 2. The latter species, from oligo- and mesohaline wells, differs in several characters from *M. sabulum*, especially in the shape of pleopods 2 and 3 of the male, in having nine (rather than eight) antenna 2 flagellar articles, a relatively longer antenna 1, and in having more slender uropodal rami.

Of the other species of *Microcharon* possessing a 5-articulate antenna 1, *M. kirghisicus* has the

typical attributes of a freshwater species; *M. harri* from England has nine antenna 2 flagellar articles and more slender uropodal rami; *M. galapagoensis* has a rounded rostrum, 12 antenna 2 flagellar articles, and the uropodal peduncle shorter than the pleotelson.

ETYMOLOGY.—The specific epithet, proposed as a noun, is from the Latin *sabulum* (coarse sand) and refers to the habitat of the species.

Family JOEROPSIDAE

Genus *Joeropsis* Koehler, 1885

Key to the Species of *Joeropsis*

(From the Carribbean, Bermuda, and Florida)

1. Lateral margins of head serrate; rostrum triangular *J. personatus*, new species
Lateral margins of head entire; rostrum not triangular 2
2. Body glabrous; pigment in 2 strong bands on head and pereonite 4; apex of ♀ operculum blunt *J. bifasciatus*, new species
Body setose; pigment in reticulation on entire body; apex of ♀ operculum acute 3
3. Rostrum evenly convex; antenna 2, flagellum of 3 articles; outer uropodal ramus longer than inner *J. rathbunae*
Rostrum anteriorly shallowly notched; antenna 2, flagellum of 5 articles; outer uropodal ramus shorter than inner *J. coralicola*

Joeropsis bifasciatus, new species

FIGURE 42

MATERIAL EXAMINED.—*Holotype*: USNM 211311, ♂, TL 1.9 mm, sta H(81)-38, from *Agaricia* sp. coral on reef platform, 1–2 m.

Paratypes: USNM 211312, 3 ♂, TL 1.4–1.8 mm, 6 ♀, TL 1.9–2.0 mm, sta H(81)-22, H(81)-38, H(81)-53, H(81)-54, from *Halimeda* sp. alga, and *Agaricia* sp. and *Porites* sp. corals on reef platform, 1–2 m. USNM 211313, 2 ♂, TL 2.0–2.5 mm, 3 ovig ♀, TL 2.0–2.4 mm, 3 juvs, sta H(80)-26, from rubble on fore reef slope, 3–6 m.

DESCRIPTION.—*Male*: Body 3 times longer than wide, parallel-sided. Rostrum semicircular,

with transparent border of spine-scales, with weak anterior concavity (giving faintly bilobed appearance if viewed oblique-dorsally); flanked by rounded lobes of anterior margin of head. Anterolateral angle of head acute; lateral margins entire; eyes dorsolateral, well pigmented. Pereonites close-set, anterolateral angles of pereonites 1–4, and posterolateral angles of pereonites 5–7 rounded; lateral margins entire. Pleotelson slightly wider than long, lateral margin with 6 teeth; posterior margin between uropodal notches triangular, apex broadly rounded.

Antenna 1, basal article longest and widest, with strong spine on mediobasal angle; outer distal angle bearing transparent dentate flange; articles 2–4 each with short distal spine on inner

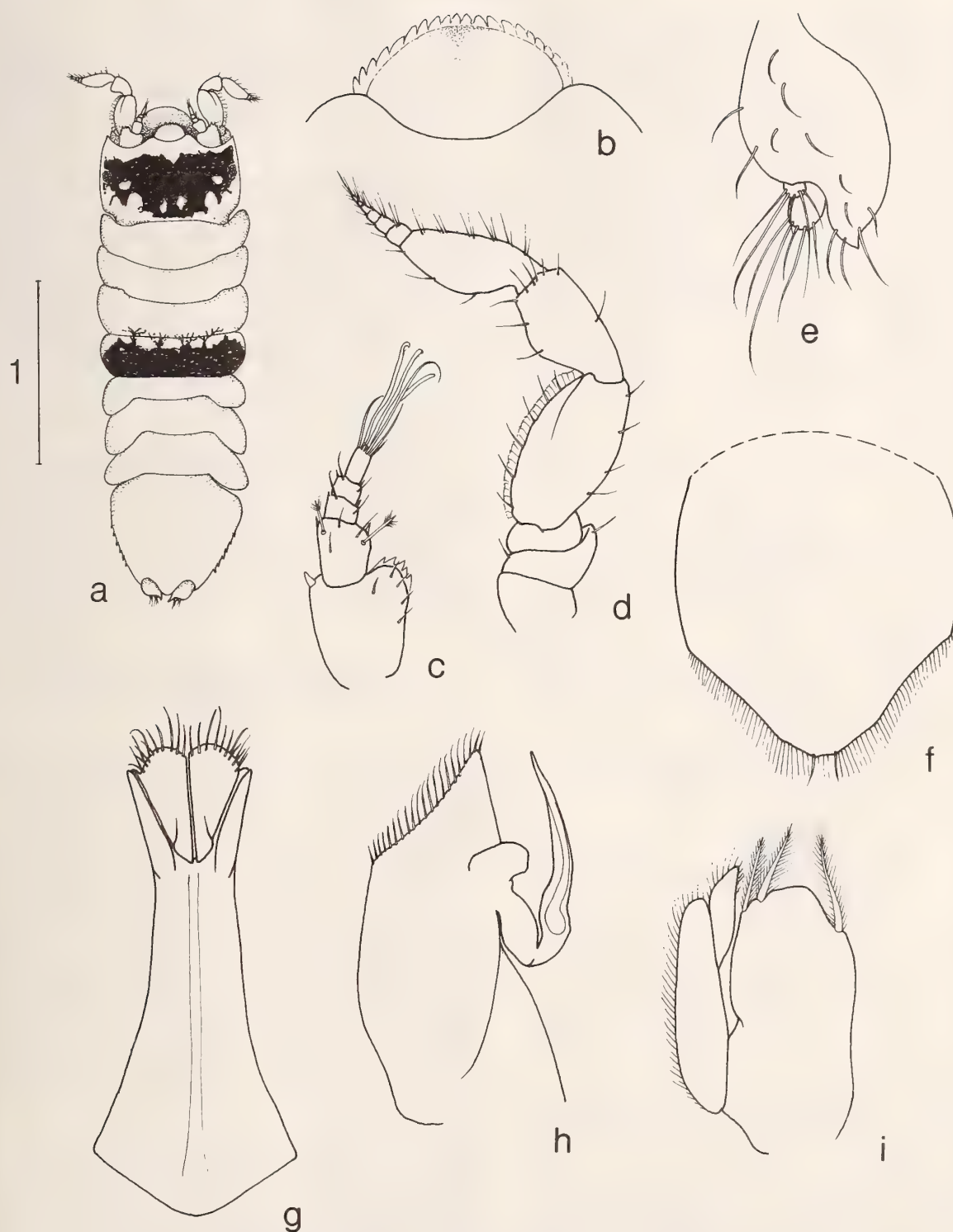


FIGURE 42.—*Joeropsis bifasciatus*, new species: *a*, whole animal, dorsal view; *b*, rostrum; *c*, antenna 1; *d*, antenna 2; *e*, uropod; *f*, operculum, ♀; *g*, pleopod 1, ♂; *h*, pleopod 2, ♂; *i*, pleopod 3, ♂.

and outer angles; articles 3 and 4 subequal; terminal article with 3 aesthetascs and few simple setae. Antenna 2, article 4 longest and widest, with flange of transparent scales on outer margin; flagellum of 8 setose articles. Mouthparts and pereopods typical for genus. Pleopod 1, rami fused for about $\frac{3}{4}$ length, inner distal lobe setose, convex, lateral lobe short, rounded. Pleopod 2, outer distal setose margin slightly concave; distal angle acute. Pleopod 3, endopod with 3 distal plumose setae; exopod biarticulate, outer margins setulose. Uropod with mediobasal angle flattened, triangular, acute; inner ramus 3 times longer than outer ramus, both rami bearing short and long setae.

Female: Operculum, proximal half with slightly convex margins, distal half tapering to apex, faintly concave, setose.

Color: Broad brown-black pigment patch on most of dorsum of head between eyes. Most of dorsum of pereonite 4 with broad brown-black band of pigment.

REMARKS.—This species may be separated from its congeners at Carrie Bow Cay by the characters used in the key.

ETYMOLOGY.—The specific epithet refers to the two dorsal bands of pigment seen in fresh material.

Joeropsis coralicola Schultz and McCloskey

FIGURE 43

Joeropsis [sic] *coralicola* Schultz and McCloskey, 1967:103, figs. 1–20.—Schultz, 1969:284, fig. 452.

MATERIAL EXAMINED.—*Holotype*: USNM 133595, ♂.

Allotype: USNM 113596, ♀.

Paratypes: USNM 113597, 6 ♂, 2 ovig ♀, 2 ♀, from coral *Oculina arbuscula*, off Cape Lookout, North Carolina.

Additional Material: FMG.I.247998181012-B-2, 10 ♂, 7 ovig ♀, 6 ♀, Florida Middle Grounds, 28°36'02"N, 84°15'36"W, 85–105 ft (25.7–31.8 m). FMG.I.247998181013B-2, 5 ♂, Florida Middle Grounds, 28°36'02"N, 84°15'36"W, 85–105 ft (25.7–31.8 m). FMG.I.247998181012-

B-6, 2 ♂, 5 ovig ♀, 5 ♀, Florida Middle Grounds, 28°36'02"N, 84°15'36"W, 85–105 ft (25.7–31.8 m). FMG.I.491998181016F-3, 5 ♂, 2 ovig ♀, 2 ♀, 28°27'18"N, 84°17'02"W, 95–110 ft (28.7–33.3 m).

REMARKS.—Re-examination of the type material of *J. coralicola* shows that the rostrum is indented anteriorly and bears a border of spine-scales, the basal article of antenna 1 has a transparent dentate flange, and the lateral pleotelsonic margins are dentate. The strong spines figured on the uropod (Schultz and McCloskey, 1967, fig. 20) are perhaps exaggerated, there being much finer scales present in all the material examined.

The species was first collected from the coral *Oculina arbuscula* off Cape Lookout, North Carolina (depth not recorded). The material from the Florida Middle Grounds came from the sponge *Agelas* sp. and the coral *Madracis*, from depths of 25–33 m.

Joeropsis personatus, new species

FIGURE 44

MATERIAL EXAMINED.—*Holotype*: USNM 211313, ♂, TL 2.2 mm, sta H(81)-29, from *Porites* sp. coral in spur and groove zone, 9.1 m.

Paratypes: USNM 211314, 4 ♂, TL 2.0–2.1 mm, 1 ovig ♀, TL 1.9 mm, 2 ♀, TL 1.9–2.0 mm, sta H(81)-10, H(81)-25, H(81)-27, H(81)-51, from *Porites* sp. coral on reef flat, 1–2 m, from *Halimeda* sp. alga, and *Madracis* sp. coral in spur and groove zone, 15.2 m. USNM 211315, ♂, TL 2.0 mm, 2 ovig ♀, TL 1.8–1.9 mm, 3 ♀, TL 1.9–2.0 mm, 1 juv, sta K-35, K-65, K-136, from rubble and *Halimeda* sp. alga in spur and groove zone, 6–20 m.

DESCRIPTION.—*Male*: Body almost 4 times longer than wide, widest at pereonites 2 and 3. Head with triangular rostrum with lateral margins finely serrate, apex finely bifid; lateral margins serrate, anterolateral angle acute. Eyes small, dorsolateral. Pereonites 1–3 with anterolateral angles acute; lateral margins of all pereonites finely serrulate. Pleotelson slightly broader

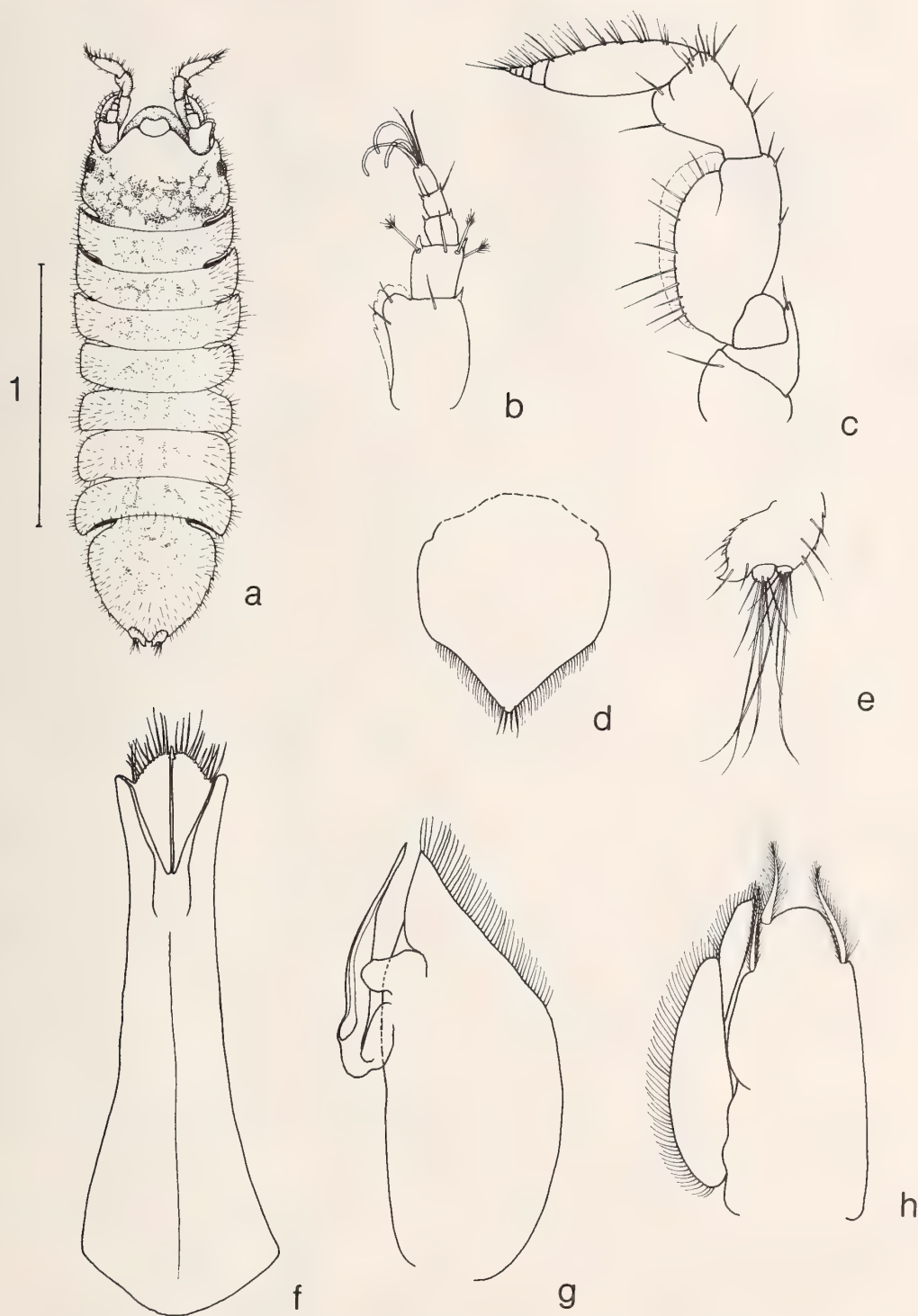


FIGURE 43.—*Joeropsis coralicola* Schultz and McCloskey: *a*, whole animal, dorsal view; *b*, antenna 1; *c*, antenna 2; *d*, operculum, ♀; *e*, uropod; *f*, pleopod 1, ♂; *g*, pleopod 2, ♂; *h*, pleopod 3, ♂.

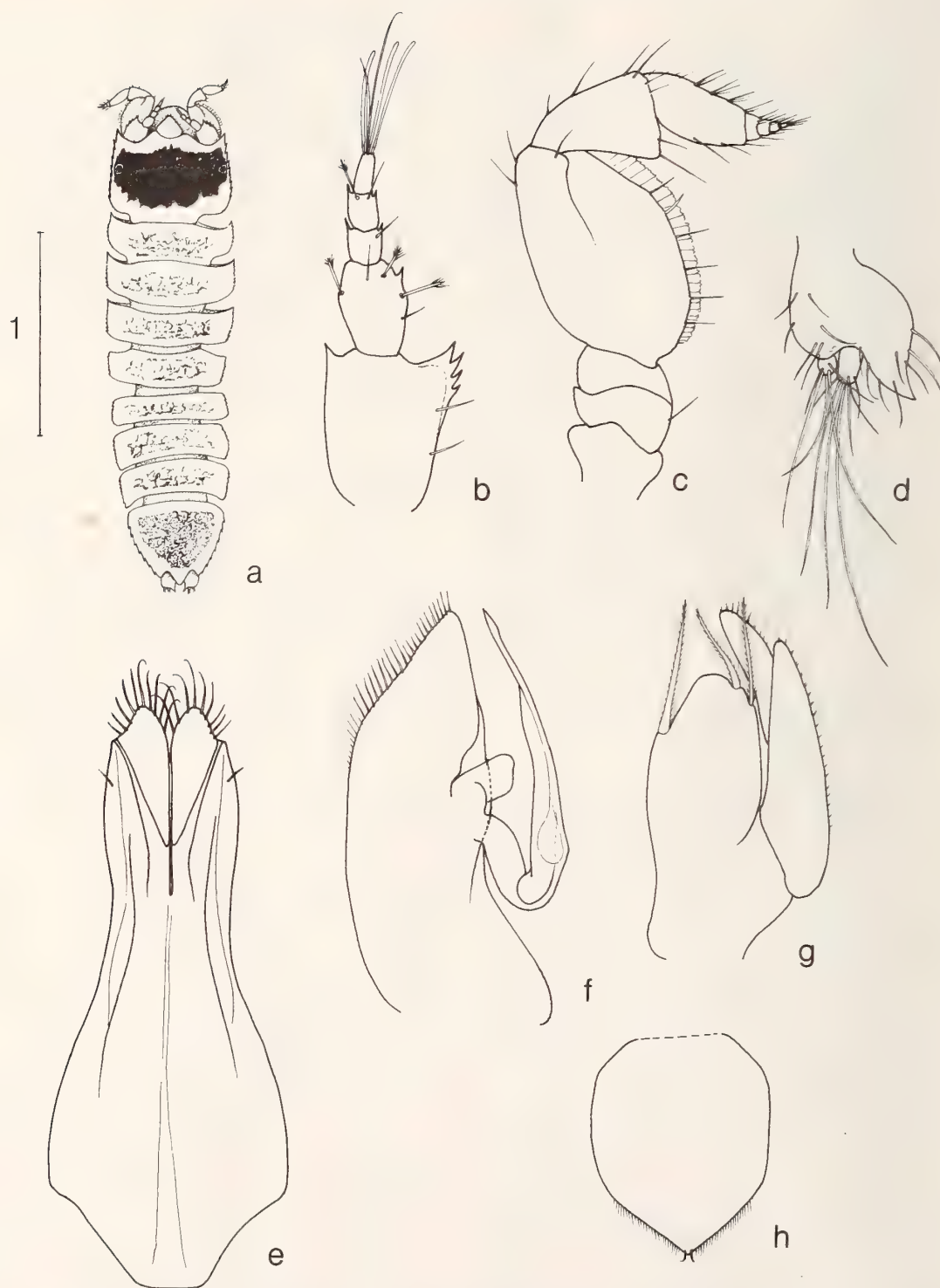


FIGURE 44.—*Joeropsis personatus*, new species: *a*, whole animal, dorsal view; *b*, antenna 1; *c*, antenna 2; *d*, uropod; *e*, pleopod 1, ♂; *f*, pleopod 2, ♂; *g*, pleopod 3, ♂; *h*, operculum, ♀.

than long; lateral margins with 7 or 8 teeth; posterior margin between uropodal notches triangular, apically narrowly rounded.

Antenna 1, basal article broader and longer than following articles, outer distal margin bearing strongly serrate flange, inner distal angle acute; article 2 with tooth on outer distal margin; articles 3 and 4 subequal in length, each with acute tooth at inner and outer distal angles; distal article bearing 3 aesthetascs and several simple setae. Antenna 2, article 4 longest and broadest, outer margin bearing row of transparent contiguous scales; flagellum of 5 setose articles. Mouthparts and pereopods typical of genus. Pleopod 1, rami fused for $\frac{2}{3}$ length; distal inner rounded lobe bearing 9 or 10 setae; lateral lobe hardly developed. Pleopod 2, exopod with outer margin distally setose. Pleopod 3, endopod with 3 plumose setae, exopod of 2 articles, with setulose outer margins. Uropod with inner distal angle bearing strong curved hook-spine; inner ramus twice length of outer, both bearing short and long simple setae.

Female: Operculum shield-shaped, tapering to acute apex in distal $\frac{1}{3}$.

Color: Head with dark-brown patch covering most of dorsum between eyes; pereonites with faint-brown dorsal reticulation; pleon with most of central dorsum with dense-brown reticulation. In preserved specimens, usually only the dark patch on the head is apparent.

REMARKS.—The species may be separated from its congeners at Carrie Bow Cay by the characters used in the key.

ETYMOLOGY.—The specific epithet is from the Latin *personatus* (masked) and refers to the dark pigment patch on the head.

Joeropsis rathbunae Richardson

FIGURE 45

Joeropsis [sic] *rathbunae* Richardson, 1902:298, pl. 40: figs. 53–55; 1905:478, fig. 537.—Schultz and McCloskey, 1967:103, 107.—Menzies and Glynn, 1968:13, 14, fig. 36A–C.—Schultz, 1969:286, fig. 454.—Menzies and Kruczynski, 1983:95, fig. 32.

MATERIAL EXAMINED.—*Syntype*: USNM 24870, ♂, Bermuda.

Additional Material: USNM 119368, ovig ♀, Puerto Rico, USNM 170855, 2 ♂, ovig ♀, 2 ♀, west of Sanibel Island, Florida, 55 m USNM 211316, 38 ♂, 28 ovig ♀, 21 ♀, 7 juvs, sta H(81)-9, H(81)-12, H(81)-13, H(81)-15, H(81)-17, H(81)-18, H(81)-23, H(81)-27, H(81)-29, H(81)-30, H(81)-32, H(81)-33, H(81)-34, H(81)-35, H(81)-36, H(81)-38, H(81)-39, H(81)-40, H(81)-41, H(81)-42, H(81)-54, H(81)-57, rubble from reef crest, reef slope and spur and groove zone, 0–15.2 m. USNM 211317, 10 ♂, 2 ovig ♀, 9 ♀, sta H(80)-22, H(80)-26, H(80)-32, H(80)-41, outer reef slope, 15–36 m. USNM 211318, 2 ♂, sta FLK-1, Looe Key, Florida, rubble from 0.5 m.

REMARKS.—Schultz and McCloskey (1967; and again noted in Schultz, 1969) examined the Peabody Museum syntype of *J. rathbunae* and noted the presence of four lateral pleotelsonic teeth. Richardson (1902) had incorrectly illustrated the pleon as being entire. Re-examination of the USNM syntype confirms the presence of at least four lateral pleotelsonic teeth.

Menzies and Glynn (1968) figured the rostrum of *J. rathbunae* from Puerto Rico as being evenly convex, with a dentate transparent border, and the basal article of antenna 1 as being dentate. In the rostrum, the basal article of antenna 1, and the pleonal margins of these teeth, being transparent, may easily be overlooked and are equally dislodged. For these reasons the species is again figured.

Family MUNNIDAE

Genus *Munna* Krøyer, 1839

Munna petronastes, new species

FIGURES 46, 47

MATERIAL EXAMINED.—*Holotype*: USNM 211319, ♂, TL 1.1 mm, sta H(81)-38, from *Agaricia* sp. coral on reef platform, 1–2 m.

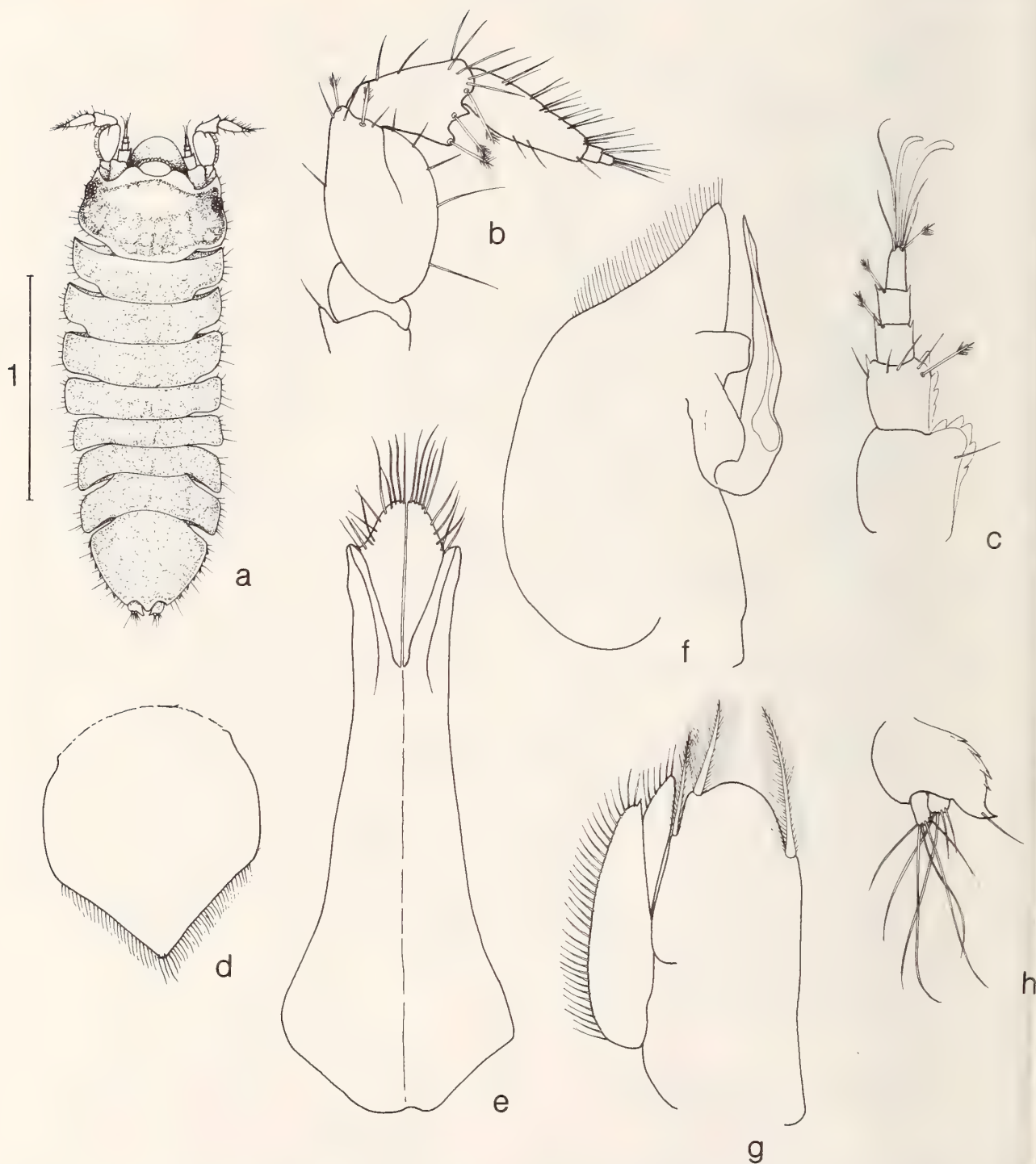


FIGURE 45.—*Joeropsis rathbunae* Richardson: *a*, whole animal, dorsal view; *b*, antenna 2; *c*, antenna; *d*, operculum, ♀; *e*, pleopod 1, ♂; *f*, pleopod 2, ♂; *g*, pleopod 3, ♂; *h*, uropod.

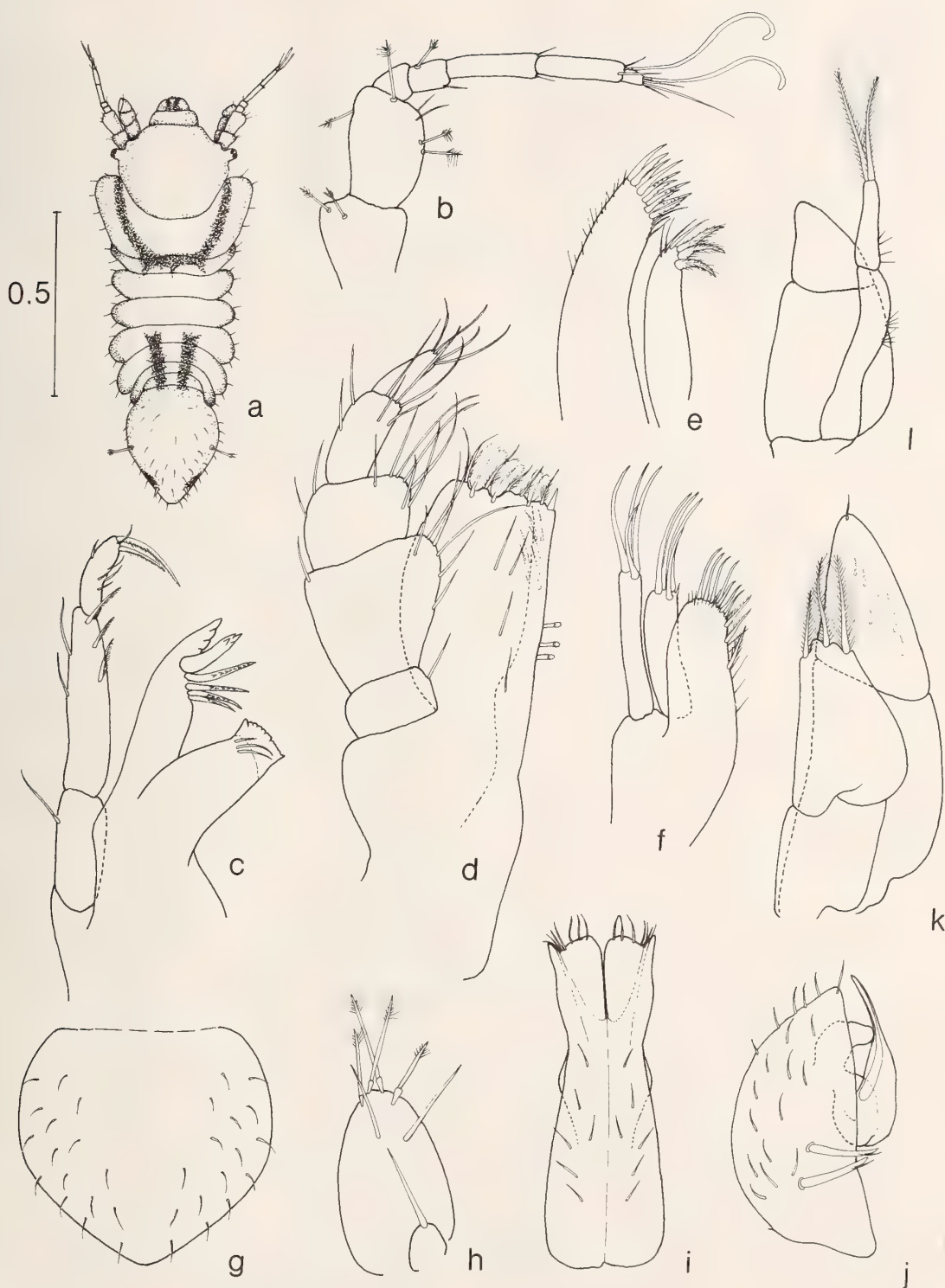


FIGURE 46.—*Munna petronastes*, new species: a, ♂, dorsal view; b, antenna 1; c, mandible; d, maxilliped; e, maxilla 1; f, maxilla 2; g, operculum, ♀; h, uropod; i, pleopod 1, ♂; j, pleopod 2, ♂; k, pleopod 3, ♂; l, pleopod 4, ♂.

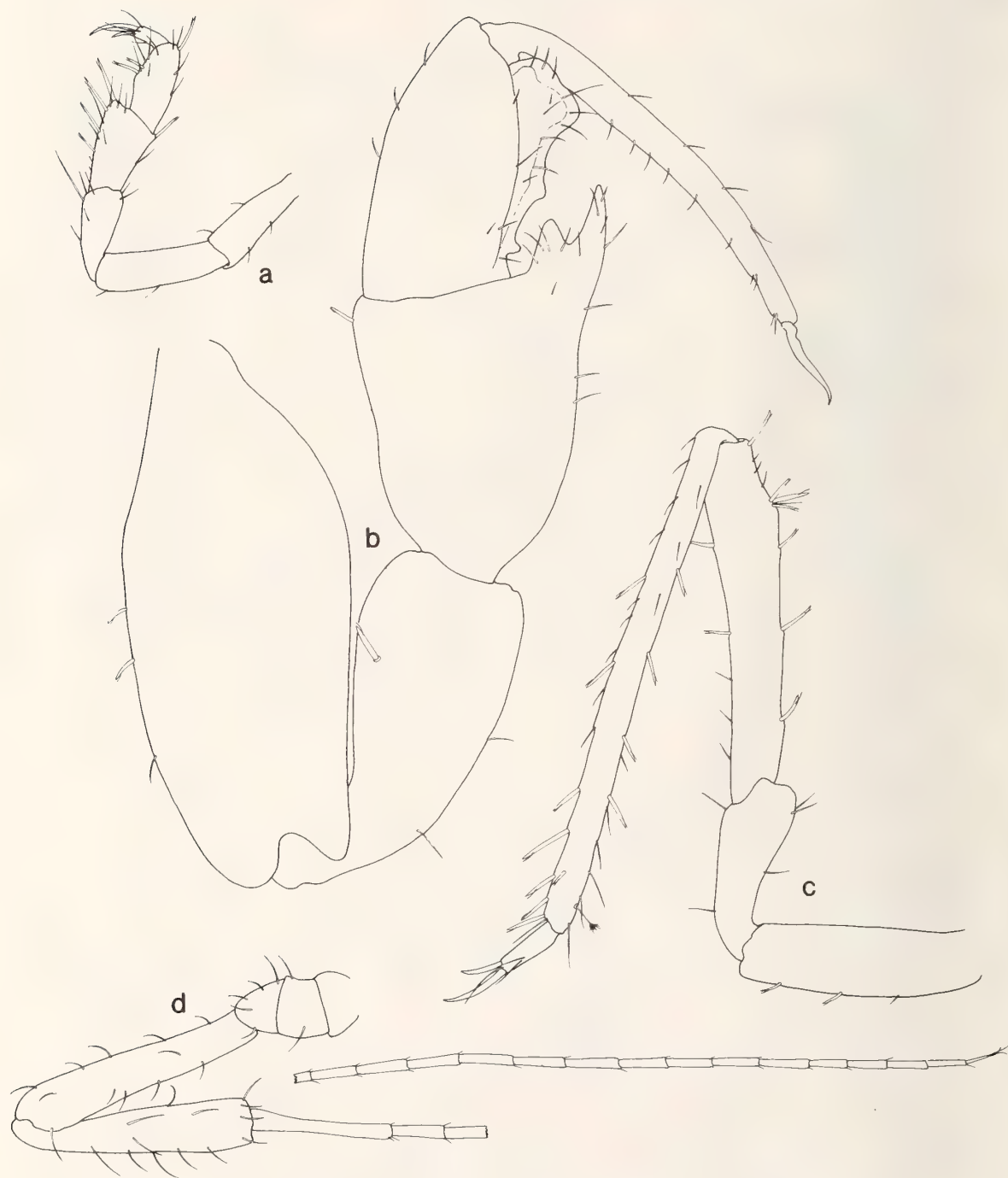


FIGURE 47.—*Munna petronastes*, new species: *a*, pereopod 1, ♀; *b*, pereopod 1, ♂; *c*, pereopod 7; *d*, antenna 2.

Paratypes: USNM 211320, 9 ♂, TL 1.0–1.1 mm, 5 ovig ♀, TL 1.0 mm, 5 ♀, TL 0.9–1.0 mm, sta H(81)-38, H(81)-40, H(81)-49, H(81)-54, from *Agaricia* sp. and *Porites* sp. corals on reef platform, 1–2 m. USNM 211321, 3 ♀, TL 0.9–1.0 mm, sta K-132, from *Agaricia* sp. coral on lagoonal patch reef, 0–1 m.

DESCRIPTION.—*Male:* Body 2.5 times longer than wide, widest at pereonite 1; latter swollen to accommodate musculature of pereopod 1. Head with straight anterior margin; eyes of 3 ommatidia, on short stalk. Pereonite 2 overlapping pereonite 1 posterolaterally; pereonite 7 overlapped by pereonite 6 and by anterior pleon. Pleon of 1 short segment plus pyriform globose pleotelson; latter longer than wide, posteriorly rounded.

Antenna 1 of 7 articles, distal 5 articles narrow; single aesthetasc on 2 distal articles. Antenna 2 with 3 short basal peduncle articles and 2 distal subequal elongate articles; flagellum of 18 very slender articles. Mandibular palp 3-segmented, segment 2 longest, with 3 distal fringed spines; terminal segment half length of segment 2, with 2 distal fringed spines; incisor of 4 cusps; lacinia mobilis of 4 cusps; 4 serrate spines in spine row; molar distally truncate, marginally serrate. Maxilla 1, inner ramus with 3 stout setulose apical spines; outer ramus with about 11 distal serrate apical spines. Maxilla 2, inner ramus with several simple and fringed spines on mediodistal margin; both lobes of outer ramus with 4 distal elongate spines. Maxilliped, palp with article 2 longest and widest, all 5 articles setose; endite with 3 retinacula on medial margin; distal margin truncate, with short spine at mediodistal angle, 5 fringed spines and 3 feather spines on distal margin. Pereopod 1 very robust, longer than medial body length when extended; merus widening distally, with single sensory spine near anterior margin; carpus widening distally, with single spine at anterodistal angle, posterodistal angle produced into strong bidentate process; propodus with posterior margin having hyaline flange produced into 2 low proximal and 1 broad distal truncate teeth; dactylus elongate-slender, about 11 times

longer than basal width, excluding unguis; latter slender, spine-like, about $\frac{1}{4}$ length of dactylus. Pereopods 2–7 elongate-slender, with sensory spines on anterior and posterior margins of carpi and propodi; dactyli biunguiculate, ungui slender. Pleopod 1, rami fused for about $\frac{2}{3}$ of length, inner distal lobe evenly rounded, bearing 7 setae; outer lobe short, triangular. Pleopod 2, outer surface of outer ramus with setae and 2 strong sensory spines, distally narrowly rounded; slender tapering part of inner ramus just extending beyond apex of outer ramus. Pleopod 3, both rami biarticulate, outer ramus with single apical seta and several setae on anterior surface; inner ramus just reaching beyond basal article of outer ramus, with 3 distal plumose setae. Pleopod 4, both rami biarticulate, outer ramus broadly triangular; inner ramus slender, tipped with 2 plumose setae. Uropod of 2 rami, longer bearing 2 simple spines and 4 sensory setae; smaller ramus about $\frac{1}{5}$ length of larger, tipped with single setae.

Female: Body ovate, widest at pereonite 4; pereonite 1 not enlarged as in male. Pereopod 1 shorter than following legs; carpus widening distally, with single sensory spine at anterodistal angle, 4 sensory spines on posterior margin; propodus widest at midlength, with 2 sensory spines on posterior margin, 1 spine at anterodistal angle; dactylus biunguiculate, anterior unguis longer than posterior, both slender. Pleonal operculum slightly wider than long, outer surface setose, distally broadly rounded.

Color: Head and pleon chalky-white; dorsal yoke of red-brown pigment on 2 or 3 anterior pereonites; 2 anteriorly diverging bars of pigment on posterior 3 pereonites and pleonite 1; dark spot on distolateral pleotelson.

REMARKS.—All three species of *Munna* that have been recorded from the general Caribbean area or from adjacent areas (*M. reynoldsi* from Georgia, Louisiana, Texas, and the Panama Canal; *M. hayesi* from Texas; and *M. santalucia* from the Rio de la Plata) lack a mandibular palp. This immediately separates them from the present species.

Munna petronastes is structurally similar to a group of species that includes *M. maculata*, *M. antarctica*, and *M. neglecta*, and which is characterized by a grossly enlarged pereopod 1 in the male and the presence of a mandibular palp (see Amar and Roman, 1974).

ETYMOLOGY.—The specific epithet is derived from the Greek *peros* (rock) plus *nastes* (dweller) and refers to the reef-dwelling habit of the species.

Suborder MICROCERBERIDEA

Family MICROCERBERIDAE

Genus *Microcerberus* Karaman, 1933

Microcerberus syrticus, new species

FIGURE 48

MATERIAL EXAMINED.—*Holotype*: USNM 211326, ♂, TL 1.1 mm, interstitial, from intertidal coarse calcareous sand, east side of Carrie Bow Cay.

Paratypes: USNM 211327, 6♂, TL 1.0–1.1 mm, 8 ♀, TL 0.9–1.1 mm, interstitial, from intertidal coarse calcareous sand, east side of Carrie Bow Cay.

DESCRIPTION.—*Male*: Body 9 times longer than wide, widest at anterior pereonite 1. Head about $1\frac{1}{4}$ times longer than wide, with truncate anterior margin, lateral margins evenly convex. Pereonite 1 with anterolateral lobes acute. Pereonites 2–4 subequal in length, with tergal plates anteriorly rounded, lateral plates acutely triangular. Pereonites 5–7 becoming longer and wider than preceding segments, each with triangular posterior tergal point mesial to pereopodal articulation. Pleon consisting of 2 free anterior segments plus pleotelson; pleonite 1 about half length of pleonite 2; pleotelson $1\frac{1}{2}$ times longer than pleonite 2; posterior margin faintly sinuous.

Antenna 1 of 5 articles, terminal article bearing few setae and single aesthetasc. Antenna 2, peduncle article 2 with tooth on medial margin; flagellum of 5 setose articles. Mandibular palp

consisting of single article bearing 1 seta, partially shielded by thin rounded membranous structure; 3 short fringed spines in spine row; molar represented by stout proximal spine, fringed distally on one margin. Maxilla 1, inner ramus short, rounded, bearing 2 short distal setae; outer ramus with 7 fringed or dentate spines. Maxilla 2 reduced to single lobe bearing 2 stout spines fringed on one margin only. Maxilliped with narrow distally rounded endite reaching to palp article 2; palp of 5 setose articles. Pereopod 1 subchelate; propodus expanded, proximal palm with 2 stout spines on short lobe-like extension, proximalmost spine with single denticle; second spine with several fine denticles; distal $\frac{3}{4}$ of palm bearing 3 stout flexed denticulate spines; dactylus with unguis half length of remainder of article (measured on outer margin); inner margin with 2 denticulate spines. Pereopods 2–7 ambulatory, dactyli biunguiculate, anterior spine becoming more slender posteriorly; all pereopods with triangular tooth on bases. Pleopod 2, endopod elongate-slender, with apically acute, proximally broad compressed lobe on outer margin. Apical lobe lanceolate, acute; styliform apophysis spiciform; chitinous lamella becoming distally narrow, apically hooked; exopod short, stubby, with single seta. Third pleopod pair bilamellar, shielded by broad triangular extension from base. Uropod biarticulate, distal setose conical article almost twice length of basal article.

REMARKS.—The present species most closely resembles *Microcerberus mirabilis* Chappuis and Delamare-Deboutteville, 1956, from the Bahamas, but differs in the following: the apical lobe of the male pleopod 2 is rounded in *M. mirabilis*, acute in *M. syrticus*; similarly the “lobe étrangle” (terminology from Chappuis and Delamare-Deboutteville, 1956, fig. 11b) is rounded in *M. mirabilis*, acute in the new species; the tergal lobes of pereonites 2–4 are rounded in *M. syrticus*, truncate in *M. mirabilis*.

ETYMOLOGY.—The specific epithet is from the Greek for “of a sandbar” and refers to the habitat of the species.

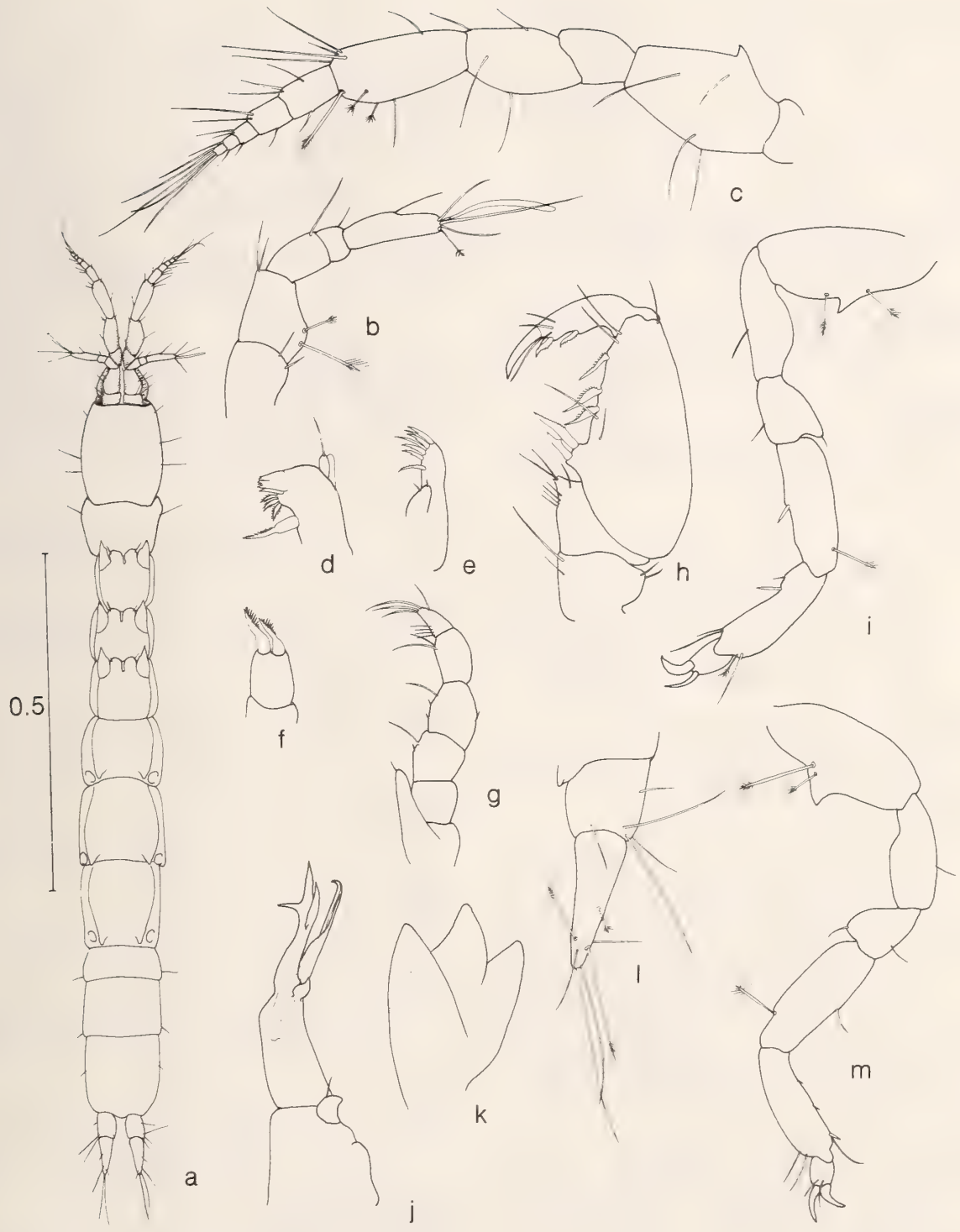


FIGURE 48.—*Microcerberus syrticus*, new species: *a*, whole animal, dorsal view; *b*, antenna 1; *c*, antenna 2; *d*, mandible; *e*, maxilla 1; *f*, maxilla 2; *g*, maxilliped; *h*, pereopod 1; *i*, pereopod 2; *j*, pleopod 2, ♂; *k*, pleopod 3, ♂; *l*, uropod; *m*, pereopod 7.

Literature Cited

- Amar, R.
1957. *Gnathostenetrioides laodicense* nov. gen. nov. sp.: Type nouveau d'*Asellota* et classification des Isopodes Asellotes. *Bulletin de l'Institut Océanographique*, 1100:1-10.
- Amar, R., and M.-L. Roman
1974. Invertébrés marins des XIIème et XVème expéditions antarctiques françaises en Terre Adélie, 14: Tanaidaces et Isopodes. *Tethys*, 5(4):561-600.
- Barnard, K.H.
1925. A Revision of the Family Anthuridae (Crustacea, Isopoda), with Remarks on Certain Morphological Peculiarities. *Journal of the Linnean Society of London, Zoology*, 36:109-160.
- Bruce, N.L.
1981. Cirolanidae (Crustacea: Isopoda) of Australia: Diagnoses of *Cirolana* Leach, *Metacirolana* Nierstrasz, *Neocirolana* Hale, *Anopsilana* Paulian and Deboutteville, and Three New Genera—*Natatanolana*, *Politolana*, and *Cartetolana*. *Australian Journal of Marine and Freshwater Research*, 32:945-966.
- Chappuis, P.A., and C. Delamare-Deboutteville
1956. Études sur la faune interstitielle des Îles Bahamas recoltée Madame Renaud-Debyser, I: Copepodes et Isopodes. *Vie et Milieu*, 7:373-396.
- Glynn, P.W.
1968. A New Genus and Two New Species of Sphaeromatid Isopods from the High Intertidal Zone at Naos Island, Panama. *Proceedings of the Biological Society of Washington*, 81:587-604.
1970. A Systematic Study of the Sphaeromatidae (Crustacea: Isopoda) of Isla Margarita, Venezuela, with Descriptions of Three New Species. *Memoria de la Sociedad de Ciencias Naturales La Salle*, 85:3-48.
1972. Rediscovery of *Paracerceis edithae* Boone (Isopoda, Sphaeromatidae) with Supplementary Notes on Morphology and Habitat. *Crustaceana*, supplement, 3:139-147.
- Hansen, H.J.
1904. On the Morphology and Classification of the *Asellota* Group of Crustaceans, with Descriptions of the Genus *Stenetrium* Hasw. and Its Species. *Proceedings of the Zoological Society of London*, 19:302-331, plates 20, 21.
- Hurley, D.E., and K.P. Jansen
1977. The Marine Fauna of New Zealand: Family Sphaeromatidae (Crustacea, Isopoda: Flabellifera). *New Zealand Oceanographic Institute Memoir*, 63:1-95.
- Kensley, B.
1980. Decapod and Isopod Crustaceans from the West Coast of Southern Africa, Including Seamounts Vema and Tripp. *Annals of the South African Museum*, 83:13-32.
1982. Anthuridea (Crustacea: Isopoda) of Carrie Bow Cay, Belize. In K. Rützler and I.G. Macintyre, editors, *The Atlantic Barrier Reef Reef Ecosystem at Carrie Bow Cay, Belize, I: Structure and Communities*. *Smithsonian Contributions to the Marine Sciences*, 12:321-353.
- Koehler, R.
1885. Description d'un Isopode nouveau, le *Joeropsis brevicornis*. *Annales des Sciences Naturelles (Paris), Zoologie*, series 6, 19:1-7, 1 plate.
- Loyola e Silva, J. de
1960. Sphaeromatidae do litorral brasileiro (Isopoda-Crustacea). *Boletim da Universidade do Paraná, Zoologia*, 4:1-182.
- Menzies, R.J., and D. Frankenberg
1966. *Handbook on the Common Marine Isopod Crustacea of Georgia*. 93 pages. Athens, Georgia: University of Georgia Press.
- Menzies, R.J., and P.W. Glynn
1968. The Common Marine Isopod Crustacea of Puerto Rico. *Studies on the Fauna of Curaçao and Other Caribbean Islands*, 27:1-133.
- Menzies, R.J., and W.L. Kruczynski
1983. Isopod Crustacea (Exclusive of Epicaridea). In *Memoirs of the Hourglass Cruises*, 6:1-126.
- Moreira, P.S.
1973. *Arcturella sawayae*, a New Species of Isopoda Crustacea from Southern Brazil. *Boletim do Zoologia e Biologia Marinha, São Paulo*, new series, 30:185-194.
- Pires, A.M.
1982. Taxonomic Revision of *Bagatus* (Isopoda, Asellota) with a Discussion of Ontogenetic Polymorphism in Males. *Journal of Natural History*, 16:227-259.
- Poore, G.C.B., and H.M. Lew Ton
In press. *Apanthura*, *Apanthuretta*, and *Apanthuroposis* gen. nov. (Crustacea, Isopoda, Anthuridae) from South-Eastern Australia. *Proceedings of the National Museum, Victoria*.

Richardson, H.

1902. The Marine and Terrestrial Isopods of the Bermudas, with Descriptions of New Genera and Species. *Transactions of the Connecticut Academy of Sciences*, 11:277-310, plates 39, 40.

1905. A Monograph on the Isopods of North America. *United States National Museum Bulletin*, 54:i-liii, 1-727.

Rützler, K., and I.G. Macintyre, editors

1982. The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, I: Structure and Communities. *Smithsonian Contributions to the Marine Sciences*, 12:i-xiv, 1-539.

Schultz, G.A.

1969. *How to Know the Marine Isopod Crustaceans*. i-vii + 359 pages. Dubuque, Iowa: Wm. C. Brown Co.

1982. Species of Protallocoxoidea and Stenetrioidea (Isopoda, Asellota) from the Antarctic and Southern Seas. *Antarctic Research Series*, 32:17-62.

Schultz, G.A., and L.R. McCloskey

1967. Isopod Crustaceans from the Coral *Oculina arbuscula* Verrill. *The Journal of the Elisha Mitchell Scientific Society*, 83:103-113.

Stock, J.H.

1977. Microparasellidae (Isopoda, Asellota) from Bonaire. *Studies of the Fauna of Curaçao and Other Caribbean Islands*, 51:69-91.

Vanhöffen, E.

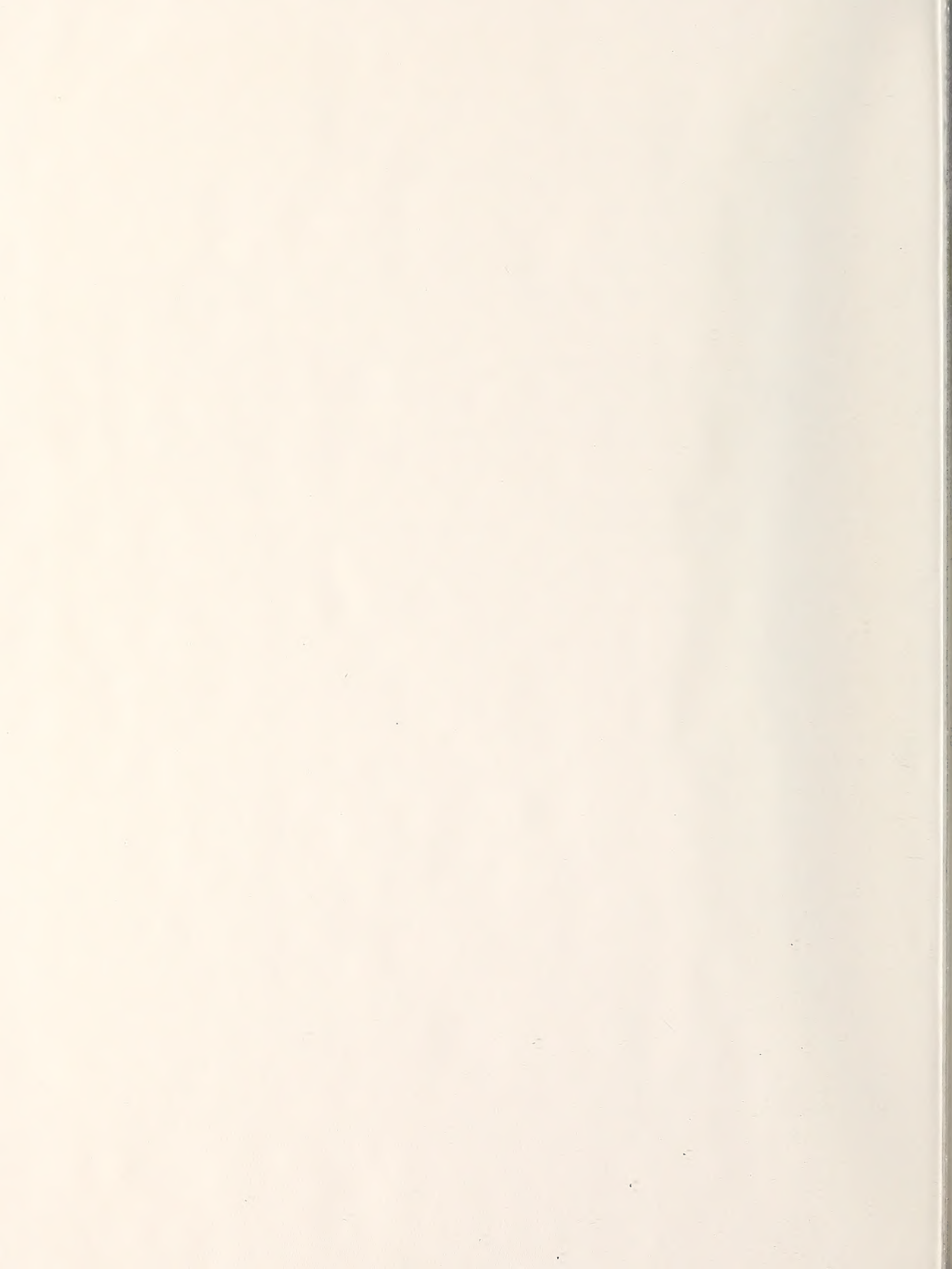
1914. Die Isopoden der Deutschen Südpolar-Expedition 1901-1903. In *Deutsche Südpolar-Expedition 1901-1903*, volume 25 (Zoologie), 7:447-598.

Wilson, G.D.

1980. Superfamilies of the Asellota (Isopoda) and the Systematic Position of *Stenetrium weddellense* Schultz. *Crustaceana*, 38:219-221.

Wolff, T.

1962. The Systematics and Biology of Bathyal and Abyssal Isopoda Asellota. *Galathea Report*, 6:1-320.



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